THE IRON TRADE REVIEW

Vol. LVII Cleveland, October 28, 1915 *No. 18*

Price Movement Continues Upward

On Pig Iron, Steel and Finished Materials—Coke Also Makes Advances—Demand Very Active

THE markets for pig iron and finished materials are alike in showing very active demand and advancing prices. More blast furnace capacity is being blown in and mills are being worked to the limit.

Prices for sheets for the first quarter of next year are the highest in 30 months. Prices have advanced 12 to 15 per cent on nuts and bolts and $7 per ton on rivets. A further advance in wire is expected.

Pig Iron

Very large tonnages of basic have been purchased, including 58,200 tons by the Lukens Iron & Steel Co., at $17.50, delivered, from six sellers. The Allegheny Steel Co. is in the market for from 18,000 to 20,000 tons of basic, and a number of other users are still actively inquiring. The leading cast iron pipe interest has bought a very large tonnage of pipe-making iron, estimated at from 50,000 to 75,000 tons. Prices of southern iron and of iron throughout the central west are higher and still further advances are expected.

Iron Ore

An eastern steel company, which has been depending, to a large extent, on obtaining its supply of ore from a foreign country, made inquiry in Cleveland last week for a round tonnage of ore, but was unable to buy any, as the Lake Superior mines have sold all the ore which they can deliver this year and do not intend to begin so early to sell for next year's delivery, for it is expected there will be an advance of at least 50 cents a ton.

Railroad Buying

Railroads have been much more active in placing cars and orders for the past week amounted to about 12,000, including 9,000 for the New York Central lines, of which 4,500 gondolas went to the Standard Steel Car Co., 2,000 automobile cars to the Haskell & Barker Car Co., 1,500 of the same type to the American Car & Foundry Co., and 1,000 to the Pullman Co. The Russian government has placed an additional order for rails with the Pennsylvania Steel Co. The exact tonnage is not known, but it is probably from 50,000 to 60,000 tons. Locomotive orders are coming in freely.

Billets

The scarcity of semi-finished steel is more pronounced and some remarkably high prices are being obtained. While the highest quotations are usually for export, domestic consumers are also compelled to pay much more than for a long time for their steel. Forging billets are being sold at from $55 to $60, Pittsburgh, in the east, and wire rods at $35 to $42, Pittsburgh.

Bars

The demand for bars for export is so heavy that it cannot be met and many mills are refusing to consider any further orders. The plant of the Diamond State Steel Co., Wilmington, Del., which has been idle for 11 years, is being rehabilitated to roll large rounds. It is understood that 50,000 tons for Great Britain have been booked for this mill, tentatively. The minimum quotation for steel bars is 1.50c, Pittsburgh, and bar iron is commanding about the same price.

Coke

In the Connellsville district, 77 per cent of the coke ovens are now being operated and on account of labor shortage it is doubtful whether the production can be increased. Prices of both foundry and furnace grades are sharply advancing.

Plates

The American Ship Building Co., Cleveland, has taken an order for two vessels to be built for shipment to Norway, and may book orders for four additional boats. Negotiations for these have been pending for some time, but the Norwegians considered the prices very high. Never before have lake ship yards been able to compete with the English builders.

THE OPEN HEARTH

A Highly Successful Meeting

THE meeting of the American Iron and Steel Institute in Cleveland last week was a decided success, not only in the record attendance, but in every other feature. The spirit manifested was one of hearty friendship and willingness to co-operate in business. Judge Gary never wearies in preaching the doctrine of good will. The papers were of a high order and in some cases indicated a vast amount of research. In the speeches at the banquet, and also in Judge Gary's address, there was a clear recognition of the danger of foreign countries dumping large quantities of products at extremely low prices in this country after war is ended. While there was some slight difference of opinion as to increasing the army and navy, it is doubtful whether there was a disagreement as to fundamentals. Probably the general plan of the national administration for increasing the army and the navy would be approved by nearly all members of the institute.

The speech of President Howard, of the Commonwealth Steel Co., St. Louis, and the moving pictures showing features of welfare work carried on by the National Tube Co., aroused keen interest and hearty applause. One of the most timely speeches at the banquet was that of President Sweetser, of the Thomas Iron Co., Easton, Pa., on the value of advertising. He was not speaking as a theorist, but as one who had had practical experience, and was able to tell the results of the right kind of advertising. Mr. Sweetser spoke with enthusiasm and was greeted in the same way.

Naturally the feeling prevalent at the meeting as to market conditions was very cheerful, but there was a tinge of sorrow because prosperity in this country is due so largely to suffering in other lands.

Building to the New Market

PERIODS of large earnings in the iron and steel industry usually find their sequel in a burst of general enlargements of capacity or in the balancing up of pig iron and steel works yields with the requirements of finishing mills which had gotten out of line through new developments in manufacturing methods, variations in market demands or other causes. Usually the finishing mills have been kept well ahead of the production of the steel works and this fact is well illustrated in the present situation, where relatively there is a famine in steel of crude or semi-finished form when the unsupplied market demand and the ability of the mills to roll much larger quantities of the desired products, if the metal were available, are considered.

Numerous plans for plant enlargements now are beginning to appear. Those that have been announced officially and others which are known to be in immediate contemplation pertain largely to additional finishing mills. In only a few instances do the plans include new open hearth furnaces to serve the increased requirements of these mills. That these must follow is obvious, if the present or expected demand, which these mills are to supply, does not disappear. Apparently, then, a generous amount of new steel works construction is in the cards for the coming year, enough perhaps to make up for the light extensions of the past 12 to 18 months. The extra needs in blast furnaces are not so assured in view of the considerable margin of surplus over current needs, especially of the merchant class, that yet is to be absorbed by market demand. Some new construction of this character nevertheless is known to be in the planning.

It is a pretty good axiom that when the iron and steel industry is not doing much new building, the immediate trade conditions are backward or the prospects are unfavorable. That there now is beginning or is in preliminary preparation so many diversified programs of enlargement among the different companies demonstrates anew the high prosperity of present conditions and the confidence of manufacturers in the combined expansion of the future market for American Steel.

The Rockefeller Proposal

THE Rockefeller plan for promoting harmonious relations between the Colorado Fuel & Iron Co. and its employes has just been published in full by *The Survey* and shows that great pains have been taken to provide all the details for carrying out this novel arrangement.

The plan provides that employes at each of the mining camps shall annually select from their number representatives to act on their behalf with respect to matters pertaining to their employment, working and living conditions, the adjustment of differences, and such other matters of mutual concern and interest as relations within the industry may determine. Details as to the election are carefully set forth. District conferences are to be held in each of the districts as conditions may demand to discuss freely matters of mutual interest and concern to the company and its employes, including suggestions to promote efficiency and production, to improve working and living conditions, to enforce discipline, to avoid friction and to further friendly and cordial relations between the company's officers and employes. The plan provides for four joint committees on industrial co-operation, safety, sani-

THE OPEN HEARTH

tation, and recreation and education. The work to be done by these different committees is briefly described. In the event of the joint committee on industrial co-operation and conciliation failing satisfactorily to adjust a difference by a majoirty decision, or by agreement on the selection of an umpire, the matter shall be referred to arbitration, or to investigation by the state of Colorado industrial commission.

In additon to the district conferences in each of the several districts, there shall be held in December an annual joint meeting, to be attended by the president of the company and such officers as he may select and by all employes' representatives of the several districts. It is specifically provided that there shall be no discrimination by the company or by any of its employes on account of membership or non-membership in any society, fraternity or union.

The plan gives evidence on its face of having been thoroughly thought out in a spirit of fairness and its prompt acceptance by employes indicates that they are impressed favorably by it and willing to give it a trial. It is difficult to see how it can fail to promote good will. The provision for regular meetings insures the representatives of the men meeting in a friendly way from time to time when there are no industrial disputes pending. One of the principal causes of industrial troubles is the failure of employers and employes to know and understand each other, as they seldom discuss matters of mutual interest except when there is a serious difference of opinion. Mr. Rockefeller has taken an important step in giving his employes a method of having grievances adjusted by joint consideration. At the same time, he has not accorded any recognition to the miners' union, which has caused so much trouble in Colorado and other parts of the country. The working of the new plan will be watched with keen interest throughout this and other countries.

Two Excellent Plans

TWO new activities have just been inaugurated by the chamber of commerce of the United States with a view to improving business methods in this country. One plan proposes the co-operation of large universities with representative business establishments in the matter of industrial research. The other calls for the establishment of a central bureau, through which information regarding the best structural standards and effective methods of commercial and trade organizations could be cleared. Both plans are commendable.

With regard to the question of industrial research, the directors of the national chamber have voted that the problems involved be referred to its committee on education or to a special committee. It has been suggested that the chamber call a meeting at Washington of the presidents of 12 prominent educational institutions and 12 heads of large industrial or manufacturing plants, each representing a different industry.

It is proposed by establishing a central bureau through which information regarding commercial organization methods and activities could be cleared to place the information at the disposal of the organization members of the national chamber. The plan, approved by the board of directors, suggests the appointment of a special advisory committee to work with the chamber's new organization service bureau. It deserves the hearty co-operation of business men.

The Safety Question

IT IS with a sense of comparative security that the modern workman goes to his daily task. Not only does this fact reflect the trend of present times toward the conservation of that highly important factor, the human being, but also shows that the much berated "bloodless corporation" has a keen regard for the welfare of its men.

The latest developments along the line of "Safety First" has been the action of the Ohio industrial commission in giving talks to the employes of the steel mills and foundries in the Cleveland district. In a recent issue of the *Iron Trade Review* an article has appeared regarding the effort that is being made to awaken a spirit of co-operation in the men whose work leads them to take certain necessary risks against which no safety appliance, however complete, can protect them. In commenting upon the attitude taken by the various concerns where talks have been delivered, mention is made of the fact that the Youngstown Sheet & Tube Co. closed its plant for 30 minutes while Victor T. Noonan, director of safety for the industrial commission, talked to the men on co-operation.

Thirty minutes represented to this company a loss of several thousand dollars, in-so-far as time value was concerned, but if that talk helped a small percentage of the men who heard it to appreciate more keenly the value of their well being, that time was well spent.

Surely costly installations, earnest requests to observe the utmost caution without regard to time losses and the conscientious and untiring effort made by these companies throughout the state are deserving of some appreciation, if it be only the hearty support of those employed in reducing to an absolute minimum the risk of injury.

Prices Present and Past

Quotations on leading products October 27, average for September, 1915, average for July, 1915, and average for October, 1914. Prices are those ruling in the largest percentage of sales at the dates named.

	Prices Oct. 27, 1915.	Aver. for Sept., 1915.	Average for July, 1915.	Aver. for Oct., 1914.
Bessemer pig iron, Pittsburgh..	$16.95	$16.80	$14.88	$14.85
Basic pig iron, Pittsburgh.....	15.95	15.65	13.83	13.90
No. 2 Fdy. pig iron, Pittsburgh	15.95	15.45	13.60	13.90
Northern No. 2 Fdy., Chgo....	15.00	13.80	13.00	13.50
Lake Superior Charcoal, Chgo..	16.25	15.95	15.55	13.50
Mall., Bess., Chgo.....	15.50	14.20	13.00	13.50
Southern No. 2, Birmingham...	12.50	11.25	9.60	10.00
Southern Ohio No. 2, Ironton..	15.50	14.25	12.60	13.00
Basic, eastern Pa.....	17.50	15.25	13.75	14.00
No. 2X Virginia furnace.....	13.75	13.25	12.50	12.50
No. 2X foundry, Philadelphia..	16.25	16.00	14.50	14.25
Ferro mang., Balti., (prompt)..	100.00	110.00	100.00	68.00
Bessemer billets, Pbgh.....	26.00	24.60	21.40	21.00
Bess. sheet bars, Pbgh.....	27.00	24.60	21.70	22.00
Op.-h'th sh. bars, Pbgh.....	28.00	25.80	22.00	22.00
Open-hearth billets, Pbgh.....	28.00	25.60	21.50	21.00
Steel bars, Chgo.....	1.64	1.54	1.46	1.30
Steel bars, Pittsburgh.....	1.50	1.34	1.26	1.20
Iron bars, Philadelphia.....	1.55	1.40	1.25	1.15
Iron bars, Cleveland, local del'y.	1.50	1.35	1.20	1.20
Iron bars, Chgo. mill.....	$1.45	$1.31	$1.20	$1.05
Beams, Chicago	1.64	1.54	1.46	1.30
Beams, Pittsburgh	1.50	1.34	1.26	1.20
Beams, Philadelphia	1.609	1.509	1.359	1.25
Tank plates, Pittsburgh.....	1.50	1.32	1.22	1.185
Tank plates, Chicago.....	1.64	1.49	1.39	1.30
Tank plates, Philadelphia.....	1.609	1.509	1.359	1.25
Sheets, blk., No. 28, Pbgh.....	2.10	1.92	1.77	1.95
Sheets, blue an., No. 10, Pbgh.	1.60	1.52	1.35	1.40
Sh., galv., No. 28, Pbgh.....	3.50	3.67	4.55	2.95
Wire nails, Pittsburgh.....	1.85	1.69	1.59	1.59
Connellsville fur. coke contr....	2.50	1.84	1.67	1.75
Connellsville fdy. coke, contr...	2.85	2.37	2.75	2.35
Heavy melting steel, Pbgh.....	14.00	14.25	11.75	11.44
Heavy melting steel, east'n Pa..	14.50	15.00	12.00	9.75
Heavy melting steel, Chgo.....	11.50	12.00	10.15	9.00
No. 1 wrought eastern Pa.....	16.00	16.00	13.25	11.50
No. 1 wrought, Chgo.....	10.50	10.75	8.90	7.75
Rerolling rails, Chgo.....	13.50	13.15	10.00	10.00
Car wheels, Chgo.....	11.75	11.75	10.30	10.50

(For Additional Prices See Page 868.)

Large Tonnage of Basic Purchased

By Eastern Pennsylvania Company—Pig Iron Quotations Advancing at All Leading Centers

Philadelphia, Oct. 25. — Purchases of basic iron for second quarter delivery by the Lukens Iron & Steel Co. now have reached 58,000 tons. This business was placed at $17.50, delivered, and all of it will be furnished in the east by six different producers. Some other basic requirements for eastern consumers are in sight tentatively. Strength in low phosphorus iron continues pronounced, and makers have little metal to offer for the next several months. Standard iron continues to be held by some producers at $26, furnace, or $28.62, Philadelphia, and export orders have been taken on that business. However, no sales yet have been made in Philadelphia territory at so high a price and the local market is quoted from $27 to $28. Lebanon makers still quote around $24, furnace, and are sold up far ahead. Nothing yet has came out of the plans considered by several eastern Pennsylvania furnaces to take up the making of low phosphorus iron. It has been found that the supply of available ore is very limited. Small lots of malleable have been sold in this territory around $18, delivered, and the market is quoted from $18 to $18.50, Philadelphia. Foundry iron still lags behind the other grades. Sales are both light and scattered. The unusual situation continues where basic iron is selling above No. 2X foundry by a considerable margin whereas normally it is from 50 cents to $1.00 below. Prices among eastern Pennsylvania producers of foundry manifest practically no change. From $16.25 to $16.75, Philadelphia, for No. 2X represent the market for this year and a round advance is wanted for delivery after Jan. 1. The Virginia Iron, Coal & Coke Co. has withdrawn all prices on No. 2X for this year, first quarter or second quarter, and has advanced other grades 25 cents. For this year, first quarter or second quarter respectively, it quotes at the furnace No. 2 plain at $13.25, $13.75 and $14.25; for No. 3, $13.00, $13.50 and $14.00; and for No. 4 and forge, $12.75, $13.25 and $13.75. The minimum of the Virginia market for No. 2X for this year is $13.75, furnace. The amount of the recent purchases of the United States Cast Iron Pipe & Foundry Co. still is indefinite, but it is generally understood it is large, and may have reached 50,000 to 75,000 tons. A southern maker is credited with 30,000 tons or more and some Virginia tonnage was taken.

Scattered Buying

New York, Oct. 26.—Sales of pig iron made in this territory during the past week have totaled from 20,000 to 25,000 tons. The market is not generally active, however, and buying remains of a scattered and miscellaneous character. Of the tonnage closed during the week, a railway equipment maker placed about 10,000 tons of malleable for first half shipment to Lancaster, N. Y., and to western plants, the business going to Buffalo and western makers. Two New Britain, Conn., consumers took 2,000 tons each of foundry iron for first half, and the E. W. Bliss Co., Brooklyn, was the buyer of 2,000 tons of 1.50 to 2 per cent silicon for January-April delivery, of which 1,000 tons was Virginia and 1,000 tons northern metal. A Cartaret, N. J., consumer ordered 500 tons of low phosphorus foundry. Prices are steady and $16.25 to $16.75, tidewater, for No. 2X continues to be quoted for this year, with varying advances for next year. There has been a good demand recently for charcoal iron in eastern territory and a sale of 1,500 tons is noted. Prices of this grade are from $16.25 to $16.75, Buffalo, for base quality. Export inquiries continue more numerous than sales. To Japan, 2,000 tons of standard low phosphorus were sold at $26, furnace, or $28.62 alongside the steamer. Italy is about to close on 1,000

(*For complete prices see page* 868.)

tons of southern foundry. Freight rates remain high, 60s to 65s to Italy being quoted. Congestion of railroad terminal yards at tidewater, because of the enormous movement of export freight, has been interfering with prompt foreign shipment of pig iron. In some cases, loaded cars have been tied up on track for a number of days.

Pig Iron Buying Begins

Pittsburgh, Oct. 26.—Inquiries for steel-making pig iron grades are numerous in the Pittsburgh district. They involve rather heavy tonnages. The Allegheny Steel Co., Brackenridge, Pa., is negotiating for from 18,000 to 20,000 tons of standard basic iron for first half delivery. The American Rolling Mill Co., Middletown, O., has entered the Pittsburgh market for 15,000 tons of third quarter basic iron and the Andrews Steel Co., Newport, Ky., is inquiring for from 10,000 to 20,000 tons of basic iron for shipment the first six months of next year. The Portsmouth Steel Co., Portsmouth, O., is asking bids on 6,000 tons of basic iron for second quarter delivery. A Westinghouse interest is understood to have taken 5,000 tons of first half foundry iron, and the American Steel Foundries has purchased 5,000 tons of standard basic for delivery this year to its plant at Sharon, Pa., paying $15.26 a ton, delivered.

Rebecca furnace of the Kittanning Iron & Steel Mfg. Co., at Kittanning, Pa., which recently sold 10,000 tons of basic to the West Penn Steel Co. for first quarter delivery, has been leased for a period of six months by the Jones & Laughlin Steel Co., which will use the stack for the manufacture of ferro-manganese from foreign ores. The Jones & Laughlin company is blowing all 10 of its blast furnaces. While this transaction takes an active stack from the merchant list, yet it permits the lessee to use an additional furnace for the manufacture of pig iron. The Jones & Laughlin company, it will be recalled, manufactured ferro-manganese last winter at Woodlawn.

Sales 60,000 Tons

Buffalo, Oct. 26. — Sales by the furnaces of the Buffalo district in the past ten days have amounted to fully 60,000 tons of the various grades of iron including a liberal tonnage of charcoal irons. The deliveries called for by the melters who came into the market for this tonnage include the remainder of the year, first quarter of 1916 and a nominal amount of the tonnage for delivery into second quarter.

Prices are being held firmly at the figures previously quoted and begin to show indications of an early advance. The producers are shipping iron steadily and at the present time in excess of their production capacity. Furnace interests report a marked scarcity of ferro-silicon iron, amounting practically to a famine.

Prices Advanced

Cleveland, Oct. 26.—The selling of pig iron in the immediate Cleveland district has been slow, but prices have been advanced to a basis of $15.50, furnace, or $15.80, delivered, for the remainder of the year or the first half of next. This advance corresponds with an advance of 75 cents, to a basis of $16, furnace, for No. 2 or malleable at Toledo, where sales during the past few days have been very heavy. On a recent inquiry from a radiator company for 25,000 tons for delivery at Buffalo, $15.70, delivered, was shaded by the furnace at Charlotte, N. Y., which took a part of the tonnage, while the remainder was not placed. The Ella furnace of Pickands, Mather & Co., at West Middlesex, Pa., has been blown in after being idle several years.

Northern Iron Brisk

Chicago, Oct. 26.—Strong buying in addition to large bookings already made by northern furnaces creates a condition of business not met in this district for some years. As a result, present prices are likely to be advanced materially before long.

Two furnaces now idle, one at the Federal plant and the other at Bayview, Milwaukee, will be blown in about Dec. 1, leaving only two idle stacks in this district. These two will not be lighted this winter. Ore supplies are a factor in the present condition. With stocks now on dock and the tonnage to be brought down in the remaining season of navigation, it will be possible to weather through until spring. Should a week or more of bad weather delay the fleet, a shortage might develop to an embarrassing degree.

Northern foundry iron of No. 2 analysis is quoted at $15.50, furnace, for last quarter and $16, furnace, for first quarter. Malleable is $15.50, furnace, for both deliveries. Competition by Michigan charcoal iron is responsible in a measure for the lower price of the latter, makers of this iron selling considerable tonnages in competitive territory at unchanged quotations.

Conditions have brought about a change in the matter of silicon content in local iron. Makers are not booking higher silicon, but are taking orders for iron that can be produced in larger tonnages. Users have been driven to southern and Jackson silveries for their silicon and the latter are well sold up and some furnaces are out of the market. Quotations of $22 and $23, furnace, for 10 per cent silveries are being made by Jackson county producers and the quotations are not guaranteed to remain in force.

Very Strong at Cincinnati

Cincinnati, Oct. 26.—The pig iron market is very strong. Southern Ohio No. 2 foundry is now being held by one large producer at $15.50, Ironton basis, for the remainder of this year, and at $16 for the first half of next year. Another large maker is out of the market for November and December, and will accept business for the first half only after submittance to the furnace. Basic iron is strong and is being held at about the same figures as foundry iron. Silvery iron has been advanced again to from $19 to $19.50, furnace, for eight per cent silicon. Virginia stacks are out of the market on No. 2X for either this year or the first half of 1916, and are holding No. 2 plain at $13.50, furnace, for the last quarter, $13.75 for the first quarter, and $14.25 for the second quarter. The minimum price of southern No. 2 foundry iron is still $12.50, Birmingham basis, for the last quarter. This includes a small amount of furnace iron and some resale iron. The majority of southern stacks are holding at $13 for this year and $13.50 for next year. Inquiry is not heavy and is scattered. A Chicago melter is asking for 1,200 tons of silvery iron and a central Indiana user wants 1,000 tons of southern foundry iron. A central Ohio manufacturer is out for 600 tons of southern foundry iron, and a local melter is expected to close for 1,000 tons of southern No. 3 foundry today. A large user in this territory has purchased between 30,000 and 40,000 tons of basic iron for the first half, and another large melter near here has taken between 5,000 and 7,000 tons of the same grade to fill in before shipments for the first half begin. Three sales of charcoal iron, of 1,000, 2,000 and 1,200 tons respectively, have been made in Michigan territory.

Sale of Malleable

St. Louis, Oct. 26.—Inquiries for pig iron in this market are limited to small lots, and there are very few of them, but prices are stiffening. The most important sale last week was one for 3,000 tons of malleable. Another sale of 350 tons of charcoal iron was reported, also quite a number of scattering ones for small lots. Southern No. 2 is held at $12.50 to $13.00 for delivery over the remainder of the year,

(*For complete prices see page* 868.)

and at $13.00 to $13.50 for first half delivery. Northern iron is quoted at $15.50 to $16.00, Chicago, and $15.00 to $15.50, Ironton.

Looking for $20 Iron

Birmingham, Ala., Oct. 26.—Makers appear very well satisfied with pig iron conditions. Buyers are cautious, however, and the large per cent of them appear to disagree with the allegation of makers that prices within the next few months will still go much higher.

No. 2 foundry for the first half of the new year is now quoted everywhere at $13.50 and one order of 1,500 tons and another of 1,000 tons are said to have been closed within the past few days at that quotation. Spot iron, it is understood, can be had at $12.50.

At Bessemer, the Tennessee Coal, Iron & Railroad Co. has blown in another furnace and is preparing still another for operations, which is expected to go into blast about Nov. 15.

One prominent interest expresses the belief that No. 2 foundry within the next six months will be selling for $18 or $20. "Buyers are asleep at the switch", he stated, "and they can't blame it on me if they wake up within a few months with no iron in stock and the market nearly double what it is now."

Ore Shortage

Now Seems Possible—Inquiry for Low Phos Ore

Philadelphia, Oct. 26.—A leading eastern steel company has been inquiring for a round block of Lake Superior ore, but has found difficulty in filling its requirements, as sellers have little additional tonnage to offer against the present movement. Predictions of a shortage of lake ore before the opening of the 1916 movement are being made more freely in eastern territory, based upon advices from western centers. In response to recent inquiries from eastern Pennsylvania furnaces for low phosphorus ore, two cargoes, or about 10,000 tons of Spanish mineral of this grade have been offered at 10 cents per unit, at tidewater. It is not believed that any large tonnages are available at this figure. Cuban makers who have about 50,000 tons available for next year have not yet named prices.

Inquiry for Low Phosphorus Ore

Cleveland, Oct. 26.—The scarcity of low phosphorus pig iron and the high prices prevailing have resulted in inquiries for low phosphorus ore for furnaces that are contemplating going into the manufacture of this grade of pig iron. There is, however, no ore of this grade available at the present time.

The weather during the past week has been very favorable for the movement of vessels and shipments of ore have been heavy. October is expected to make a very favorable showing in tonnage moved.

Ore Rates

Hearing at Pittsburgh Concluded for the Present

Examiner A. F. Haggerty, of the interstate commerce commission which is conducting an inquiry into iron ore carrying rates from lower lake ports to points in western Pennsylvania, eastern Ohio, West Virginia and Kentucky, adjourned the hearing at Pittsburgh Saturday after hearing testimony for a week. Hearings will resume upon the call of the commission.

Testimony in the cases of the Wheeling Steel & Iron Co., Wheeling, W. Va., and the Pittsburgh Steel Co., Pittsburgh, which are complaining against the 88-cent rate on iron ore to the districts in which they are located, was completed. Isaac M. Scott, president, and W. H. Higgins, traffic manager, of the Wheeling Steel & Iron Co., offered testimony against the 88-cent rate to Wheeling. In reviewing the rate, Mr. Scott explained that it was adopted Aug. 15, 1913, at which time Steubenville and Mingo Junction, O., were taken out of the Wheeling district and put into the Beaver district, which enjoys a 70-cent rate on iron ore from lower lake ports. On the same date, the rate to Pittsburgh was reduced from 96 cents to 88 cents a ton.

A. R. Kennedy, traffic manager of the Pittsburgh Steel Co., and F. A. Ogden, freight agent for the Jones & Laughlin Steel Co., and J. P. Muller, a statistician of Washington, D. C., appeared for complainants against the 88-cent rate to Pittsburgh. Mr. Kennedy introduced exhibits showing that approximately 44 per cent of the ore shipped from lower lake ports goes to Pittsburgh, 30 per cent to Youngstown, 3.52 per cent to Wheeling and 8.09 per cent to Aliquippa, Woodlawn and Midland, Pa. Iron ore carrying rates to the several districts affected, range from 50 cents per ton, which applies to South Columbus, O., to 92 cents per ton, the rate applying to Johnstown, Pa. Witnesses explained that some competitors enjoy commercial advantages, because of lower assembling costs in the manufacture of pig iron and finished steel products.

(*For complete prices see page* 868.)

Coke is Strong

Furnace Coke Suddenly Jumps—Foundry Also Advances

Pittsburgh, Oct. 26.—Connellsville coke at last seems to reflect decided strength. Spot fuel has jumped from $1.75 to $2.75 in the last two weeks and foundry coke has advanced to a basis of $3, ovens, for prompt and future delivery. While demand is not heavy, yet enough fuel has been sold at advanced prices to show actual market strength. With 77 per cent of the ovens in the upper and lower regions in blast, it appears as if Connellsville cokemakers are operating almost at capacity, since it will be difficult to fire additional ovens, because of the scarcity of labor. Several negotiations involving fuel for shipment next year are pending, but no contracts have been made recently. For the week ending Oct. 16, the *Connellsville Courier* says production was 421,091 tons, an increase of 3,267 tons compared with the previous week.

Coke Prices Advance

Cincinnati, Oct. 26.—The coke market is very strong. Prices in the Wise county, Pocahontas and New River districts are advancing and are much higher this week than last on both furnace and foundry grades. The shortage of furnace coke is very noticeable, and shipments of foundry coke are heavier than in years. In some cases, furnaces are buying spot lots when these can be obtained, but most of the coke being made now is contracted for until after the first of the year. Wise county furnace grades are quoted at from $2.40 to $2.50, ovens, and the same kind from the Pocahontas and New River districts are given at from $2.50 to $2.75, ovens.

Spot Moves Up

Philadelphia, Oct. 26.—Spot coke has moved up sharply during the past few days in the eastern market. A sale of 30 cars of furnace coke for immediate delivery was made to the Schuylkill valley furnace at $2.40, Connellsville ovens. Since then, reports have reached the east of sales of $2.50, $2.65 and $2.75, ovens, and there is a report that $2.90 has been paid. One seller refused an offer of $2.50, ovens, for first half. Shortages of labor have added their effect to the increased demand for coke which has produced the present buoyancy of the market.

Leigh Best, vice president of the American Locomotive Co., has been made a director of the company.

Bar Capacity is Strained

On Account of Heavy Demand—Prices Advancing and Difficulty Experienced in Making Deliveries

Philadelphia, Oct. 25.—Makers still are unable to meet the heavy demand for large rounds intended chiefly for the manufacture of shrapnel and high explosive shells, and further large sales are lacking because the capacity is not available. The trade hears that the steel works and bar mills of the Diamond State Steel Co., Wilmington, which have been idle for 11 years, now are being rehabilitated to produce large rounds up to 6 inches. An order for 50,000 tons for the British is reported to have been placed tentatively with the parties who are planning to operate the works. Manufacturing is expected to begin in almost 90 days. Makers report they can readily obtain 3c, mill, on tonnage lots of large rounds, and on several thousand-ton transactions, 3.25c and 3.50c, mill, have been paid. On cold rolled rounds, good-sized lots have been booked in this territory at 60 off. The situation with the regular domestic steel bar trade shows no improvement in deliveries, as mill capacity is sold up months ahead and some makers are not selling at all at present. Prices now range from 1.45c to 1.50c, and some contracts are being taken for first quarter, but not many. The Carnegie Steel Co. will supply 2,000 tons of bars and the Pollak Steel Co. 6,000 5½ x 10-inch axles to the Norfolk & Western for cars. A Lebanon, Pa., buyer has inquired for 700 to 800 tons of rivet rods.

Large Rounds Sold

New York, Oct. 26.—Sales of about 6,000 tons of large rounds were closed in this territory by an eastern Pennsylvania maker the past week at 3.25c at the mill. This maker and some other sellers of large rounds now are quoting from 3.25c to 3.50c, mill, on moderate tonnages. It is understood that 3c, mill, still may be done with other makers on large tonnages. With the oncoming of more active rail buying, some of the companies which have been rolling large rounds on their rail mills have been obliged to curtail their offers. Buyers, accordingly, are having increasing difficulty to fill their requirements and a huge tonnage is practically going begging. Some round mills have their output engaged for six months ahead. Roumania continues in the market for shrapnel steel in lots of 5,000 and 10,000 tons. Representatives of French steelworks who inquired recently for 50,000 tons monthly for first half are believed to have satisfied a considerable portion of this requirement. A good tonnage of it is understood to have gone to the Ensley mill. Because of their badly congested condition, the mills are not taking on much new business from the regular steel bar trade. Prices are quoted at 1.45c to 1.50c, Pittsburgh.

Bars Difficult to Buy

Chicago, Oct. 26.—The only comment possible on the steel bar market is the continuance of heavy demand and reference to the sold-up condition of almost all mills. Sales departments are expecting any day to receive orders to the effect that no more contracts can be taken, and it appears that practically all mills have nothing to offer for new business until Jan. 1, and that mill capacity is fairly well cared for through first and second quarters. Nearly all important consumers who are regular buyers are cared for in these bookings and no maker is seeking new business, as sufficient is being offered at all times to keep operations at highest capacity.

The prevailing quotation is 1.64c, Chicago mill, and nothing lower than this is offered. Word comes from the east that some business has been taken on a basis of 1.50c, Pittsburgh, but no such price has been made by western mills on bars.

Bars Easily Sold at 1.50c

Pittsburgh, Oct. 26.—The Carnegie Steel Co. on Oct. 25 advanced its minimum price of steel bars to 1.50c, which appears to represent the bottom of the market in this district. Orders for steel bars from domestic consumers are decidedly heavy and specifications and inquiries for shrapnel stock involve tremendous tonnages. Shipments of steel bars are deferred from two to six months. Iron bars are being held at 1.50c and above in this district.

Bar Iron Tonnage Larger

Chicago, Oct. 26.—An increase of $2 per ton on bar iron was made last week, raising the quotation from 1.35c to 1.45c, Chicago. Notice of the increase brought in a tremendous tonnage before it went into effect and mills which have been running from hand to mouth for some time now have commitments sufficient to run for many weeks, and the output for the remainder of the year seems to be safely on a capacity basis. Large sales of freight cars have assisted materially in bringing out this tonnage and a number of consumers of steel bars now unable to get deliveries are turning to iron with the result that bar iron mills are experiencing some of the same prosperity which was the portion of steel mills several months ago.

(For complete prices see page 868.)

Bar Iron Higher

Cleveland, Oct. 26.—The Carnegie Steel Co. has advanced its quotation on steel bars to 1.50c, Pittsburgh, for current delivery or first quarter and this price is now the minimum. Several companies are unable to take on any additional tonnage for the remainder of this year and with all the question of delivery is paramount. Shafting has been advanced to 58 off for carload lots and 53 off for less than carload lots. Spikes are now quoted at 1.70c, an advance of 10c. Bar iron has been advanced to 1.50c, Cleveland.

Hoops, Bands and Shafting

Pittsburgh, Oct. 26.—The Jones & Laughlin Steel Co. and the Columbia Steel & Shafting Co. have advanced prices of cold rolled steel shafting $2 a ton and are now asking 58 per cent off the list for carloads and 53 per cent off for less than carloads. Cold rolled strip steel has been advanced $3 a ton to a 3.25c base. Steel hoops are being held at 1.75c or $3 a ton above the previous price, and bands are commanding 1.50c, or $1 a ton above the prevailing price before Oct. 25.

Nuts, Bolts and Rivets

Pittsburgh, Oct. 26. — Structural rivets are being held at 1.90c and boiler rivets at 2c by leading makers in the Greater Pittsburgh district. Nuts and bolts are firm at prevailing prices. Shipments to domestic consumers are comparatively heavy and considerable export business is enjoyed.

Bolt Prices Firm

Chicago, Oct. 26.—Makers of nuts and bolts are insisting on full list prices and the shading which was noticed almost universally during the summer has practically disappeared. Tonnages being booked by manufacturers are large and mills seem assured of practically capacity operation during the remainder of the year.

Delivery of Shapes Lags

New Work Coming Out More Freely—Prices Are Strong, But Some Irregularity Among Fabricators

Philadelphia, Oct. 25.—A recent lull in the volume of new specifications to eastern Pennsylvania shape makers, following the close of the second quarter, is beginning to disappear, though the movement still is less than several weeks ago. This temporary quietness has been welcomed by the producers in view of the condition of their deliveries, but their accumulated tonnage is such that they have made little headway. Deliveries for any assortment of sizes still run from six to ten weeks. New work seems to be coming out more freely in this territory. Prices are strong. For ordinary amounts for shipment when the mills are able, 1.50c, Pittsburgh is named and smaller quantities command up to 1.60c, Pittsburgh. Large tonnages still can develop 1.45c, Pittsburgh. Some of the larger mills recently took first quarter contracts in this district at 1.40c, Pittsburgh. Fabricated prices lack uniformity and work was accepted in this district within the week at less than $40 per ton delivered. The Carnegie Steel Co. and the Jones & Laughlin Steel Co. will furnish about 6,000 tons of shapes for Norfolk & Western cars.

Shapes Held at 1.50c

Pittsburgh, Oct. 26.—Structural shapes now are being held at 1.50c by the Carnegie Steel Co., the Jones & Laughlin Steel Co. and other manufacturers in the Greater Pittsburgh district. Mills are unable to promise delivery in less than from six to 12 weeks. Fabricating shops are enjoying considerable activity and are specifying to the full extent of contracts. The McClintic-Marshall Co. has taken 25,000 tons for elevated station work at Philadelphia. The American Bridge Co. has taken 3,000 tons of steel for seven car floats for the Lehigh Valley Railroad Co., and also has received a contract for a new building for the Toledo Machine & Tool Co., Toledo, O., which will require 350 tons.

Votes Will Decide

Cleveland, Oct. 26.—There is very little activity in building projects involving any considerable tonnage of steel, but the strength of the eastern market is shown by the action of one important company in eastern Pennsylvania in advancing its quotations to a basis of 1.65c, Pittsburgh. At the election to be held in Cleveland next Tuesday, a number of projects involving large tonnages of steel are to be voted upon, including the union depot, the Barber subway, a four-track, 5-mile project, the Cleveland & Youngstown terminal and extensive grade elimination work. The approval of the new depot by the voters seems to be assured, and it is probable that most of the other projects will be favorably acted upon.

Shapes Are Steady

Chicago, Oct. 26.—Demand for structural shapes is increasing steadily and considerable business is still to be taken by fabricators and mill. Deliveries now are deferred until December on business being booked at this time. No quotation lower than 1.64c, Chicago, is heard.

Catching Up

New York, Oct. 26.—New work in structural steel in this immediate territory continues rather light, due in some measure to the nearing of the end of the active season, but eastern and southern railroads still are placing a good tonnage of bridges and other requirements for late delivery. An interesting new inquiry calls for 1,000 tons of bridge work for the British government. Specifications with the mills have not been so heavy, due to the smaller building work, but this has not enabled them to improve much in their deliveries which still run from six to 10 weeks, where any number of mixed sizes are desired. Prices are strong at 1.45c to 1.50c, Pittsburgh, or 1.619c to 1.669c, New York. Where prompt shipment can be made, premiums are obtainable.

CONTRACTS PLACED.

Toledo Machine & Tool Co., Toledo, O.; new buildings, 350 tons; awarded American Bridge Co.

Seven car floats for the Lehigh Valley Railroad Co., 3,000 tons; awarded the American Bridge Co.

Rebuilding No. 1 blast furnace and stoves of the Carnegie Steel Co. at Bellaire, O., 1,500 tons; awarded the Riter-Conley Mfg. Co.

Kinney & Woodworth commercial building, Albany, 900 tons, contract to Levering & Gerrigues, Albany.

State Highway bridge, Lyons Falls, N. Y., 300 tons, general contract to W. S. Rae, Pittsburgh.

Tod House, Youngstown, 485 tons; general contract to Heller Bros., Youngstown, and steel to W. N. Kratzer Co., Pittsburgh.

Structural steel for four industrial plants in the south, 1,600 tons, awarded to the American Bridge Co. by the Pratt Engineering Co., Atlanta, Ga.

Enlargement of Bristol Arms Co., Bristol, Conn., 700 tons, to Levering & Gerrigues.

Additions to the plant of the Waterbury-Farrel Foundry & Machine Co., Ansonia, Conn., 500 tons, to an independent shop.

Engineering building of the John Hopkins University, Baltimore, 400 tons, to the American Bridge Co.

Bridge work for the Delaware & Hudson, 300 tons, to the American Bridge Co.

Bridge work, for the Baltimore & Ohio railroad, 250 tons, to an independent shop.

Garage for the New Jersey Auto Supply Co., Camden, N. J., 400 tons, to the American Bridge Co.

Steel work for the Frankfort elevated line, Philadelphia, 23,000 tons, to the McClintic-Marshall Co.

Bridge work for the Maine Central railroad 2,500 tons to the American Bridge Co.

Two apartments, New York City, 1,200 tons, to the Belmont Iron Works.

Maher loft building, Twenty-sixth street and Lexington avenue, New York City, 250 tons, to the Hedden Iron Construction Co.

Delaware school, Syracuse, N. Y., 550 tons, general contract to the Onondaga Building & Construction Co.

Brier Hill Steel Co., Youngstown, O., open hearth furnaces, 2,000 to 2,500 tons structural, Lackawanna Bridge Co., Buffalo, fabricating contract.

Contractors' Plant Mfg. Co., plant addition, Buffalo, to cost $15,000, taking 100 tons, general contract to John W. Cowper Co., Buffalo.

Great Northern Ry. Co., plate girder spans and viaduct work, 3,000 tons, to American Bridge Co.

Times Publishing Co., new Times building, Seattle, Wash., 1,357 tons, to Vulcan Mfg. Co.

Alterations to the Fair Store, Chicago, 512 tons, to South Halsted Street Iron Works.

Tamarack Mining Co., addition to Lake No. 2 stamp mill, Mills Station, Mich., 288 tons, to Worden-Allen.

Wisconsin Highway Commission, four 215-foot riveted truss spans, Wood county, Nekoosa, Wis., 270 tons, to Wussau Iron Works.

United States government, two magazine buildings and shell house, Ostrich Bay, Puget Sound, Wash., 129 tons, to Minneapolis Steel & Machinery Co.

Tamarack Mining Co., steel trestle between No. 1 and 2 stamp mills, Mills Station, Mich., 144 tons.

CONTRACTS PENDING.

United States Appraisal stores, Boston, 2,000 tons, P. J. Carlin Construction Co., low bidder.

Bridges for Boston & Maine railroad, 1,000, bids being taken.

Theater, Brockton, Mass., 700 tons, bids being taken.

Transmission towers at Pottsdam, N. Y., 300 tons, bids being taken.

Industrial plant at Curtis Bay, Md., 500 tons additional, bids being taken by Geo. A. Fuller Co.

Buildings for the National Folding Box & Paper Co., at New Haven, Ct., 600 tons, bids being taken.

Christian Science Church, Detroit, Mich., 300 to 400 tons, bids being taken.

Additional work for the Winchester Repeating Arms Co. at New Haven, Ct., 500 tons; bids being taken.

Pier sheds for the Norfolk & Western railroad, Norfolk, Va., 2,000 to 2,500 tons, bids being taken.

Central power house, Washington, D. C., 3,000 tons, bids to be taken Nov. 17.

(*For complete prices see page* 868.)

Sheet Prices Much Higher

Unprecedented Advances, Especially on Open Hearth —Export Inquiries Are Heavy

Youngstown, O., Oct. 26.—The advance in steel sheet quotations is gaining momentum. The rise in the past week has been unparalleled in years. Last Tuesday a fair tonnage of open hearth steel sheets could have been placed at 2c for No. 28 gage, Pittsburgh. Today the minimum on this gage in this district is 2.20c, a gain of $4 a ton in a week. Most mills are quoting only for immediate delivery, and giving buyers an option for only two days. The distinction between open hearth and bessemer sheets is steadily being more sharply drawn. Mills buying open hearth sheet bars are booking no more business than they can help, just at the present time, in sheets. They are too anxious as to the possibilities the semi-finished steel situation may develop.

Advancing sheet prices have stimulated buyers' interest. A number of consumers and representatives visiting producers today, trying to cover for the first quarter. Little of this business is being taken. One producer has established tentative quotations of 2.25c for bessemer and 2.35c for open hearth black sheets for first quarter delivery, but is making no sales at those prices. The prompt market on bessemer black sheets is 2.10c for No. 28 gage.

Galvanized Sheets Higher

Increasing steel and spelter prices are pushing galvanized sheet quotations up again. The minimum quotation of valley mills is 3.70c, for No. 28 gage; several mills are asking 3.80c. Only two weeks ago a consumer in this district placed a good tonnage at 3.15c.

Demand for blue annealed sheets continues far above normal. Prices are extremely strong. Many sales to domestic consumers have been made at 1.80c, and the minimum is 1.75c for No. 10 gage.

Export inquiries for sheets continue in heavy volume. Brazil has taken considerable tonnages of galvanized sheets recently, while black sheets have been going to Chile and Argentina. J. P. Morgan have some large inquiries out for blue annealed sheets, presumably for use in trenches or underground work. One of these, for shipment to France, calls for 6,600 tons of 12 and 13 gage, but has received no action from valley makers because of the unusual widths specified.

Sheets Show Strength

Pittsburgh, Oct. 26.—Steel sheet products reflect strength in western Pennsylvania and eastern Ohio. Some makers are quoting as high as 2.25c for No. 28 gage open hearth sheets for shipment the first quarter of 1916, but material continues to be offered on the basis of 2.10c for prompt delivery. Blue annealed sheets are quoted at 1.70c by some mills. Galvanized material has strengthened moderately as a result of heavier demand. Additional sheet mill capacity gradually is being engaged and mills will operate at capacity just as soon as the market for galvanized products becomes more nearly normal.

Sheets Marked Up

Cleveland, Oct. 26.—The demand for sheets continues very active and some tonnages have been sold as high as 2.25c, Youngstown, for first quarter for No. 28 black, while even as high as 2.30c, valley, is being quoted. On No. 10 blue annealed some makers are asking 1.80c, Youngstown, for the first quarter.

Sheets Are Stronger

Chicago, Oct. 26.—Demand for steel sheets is increasing and quotations are stiffening materially. No. 28 gage black is now steady on a basis of 2.29c, Chicago mill, with No. 10 gage blue annealed at 1.84c, Chicago mill. Galvanized continues uncertain, with 3.19c to 3.84c, Chicago, quoted by such makers as remain in the market.

Sheets Advance Slowly

Cincinnati, Oct. 26.—Sheets are strong and are slowly advancing. Black No. 28 gage are now being held firmly at 2.10c, Pittsburgh basis, for nearby delivery, and mills are refusing to sell for extended shipments. Galvanized sheets No. 28 gage are quoted at 3.75c, Pittsburgh basis, although 3.65c could probably be done on desirable business for spot delivery. Mills are experiencing much difficulty in securing shipments of ferro-silicon and ferro-manganese, and the shortage of these alloys is beginning to reach the acute stage.

Ask Sheets for Trenches

Philadelphia, Oct. 25.—Eastern Pennsylvania makers of sheets have been receiving some inquiries from the English government for blue annealed sheets, which, it is understood, are for trench covers. Nothing has resulted from these inquiries. Home demand for blue annealed remains very active with eastern mills, which are producing at full capacity. Prices are firm at 1.70c to 1.80c, Pittsburgh, or 1.859c to 1.959c, Philadelphia, for No. 10 gage, blue annealed.

Tin Plate Price Not Named

Pittsburgh, Oct. 26.—While no official announcement has been made relative to the price of tin plate for shipment next year, expressions are heard that material will be held at $3.40 per base box. Specifications are not heavy, but this is not surprising in view of the fact that canning interests practically have completed their seasons.

(For complete prices see page 868.)

Cast Iron Pipe

Makers Expect to Raise Prices at Early Date

New York, Oct. 26.—New Britain, Conn., has put out an inquiry for 900 tons of 6's to 30's for bids on Nov. 4. Figures are being submitted today on 1,000 tons of 6's and 8's for Peapack, N. J. The United States Cast Iron Pipe & Foundry Co. has received 2,000 tons of 6's to 36's from a contractor for East Liverpool, O. The city of Detroit is understood to have placed 3,000 tons of 4 to 24's, representing its 1916 requirements, but the distribution has not yet been learned. The market is not active in municipal lettings because of the lateness of the season, but private buying and other miscellaneous requirements are enabling eastern foundries to maintain their rate of recent operations. A liberal buying movement of the gas and water companies for 1916 delivery toward which preliminary overtures have been made by the users, is expected to be inaugurated shortly at a higher level.

Will Cost More

Chicago, Oct. 26.—Cast iron pipe makers appear to be on the verge of another advance, following the upward movement of pig iron. Quotations this week in the Chicago market remain the same as last, but at least $1 per ton probably will be added during the week. Demand is light just at this time but large cities are preparing to enter the market for their requirements and a flood of business is expected to develop shortly. Bids will be opened Oct. 28 at Gallatin, Mo., on 150 tons and Nov. 9 at Belleville, O., on 400 tons.

Plate Prices Advancing

Deliveries From Some Mills Now Extend Into the First Quarter—Heavy Tonnages for Ships and Cars

Philadelphia, Oct. 25.—With its deliveries now runinng around ten weeks or into the first quarter, a leading eastern Pennsylvania plate producer has advanced $2 further to 1.60c, Pittsburgh, or 1.759c, Philadelphia. This represents the present ideas of this producer as to the probable level of the first quarter market. Contracts are not desired even at the new price. The minimum price other eastern producers are quoting is 1.50c, Pittsburgh, and marine work is furnishing a big tonnage which is estimated at about 20 per cent of the total specifications now being received by eastern mills. One important maker now has on its books in actual specifications more than 50,000 tons of orders, or about 14 weeks' full rolling and perhaps 10,000 tons of this is ship steel. The Standard Oil Co. closed in the week for two additional tank ships with the Harland & Hollingsworth Corporation. These will require about 7,000 to 8,000 tons of steel. The Carnegie Steel Co. will furnish 9,000 tons of plates in addition to other car material for the Norfolk & Western railroad for 1,600 hoppers to be built in the road's own shops.

Steel for Dreadnaughts

New York, Oct. 26.—Shipbuilders who will bid upon this contract now have asked makers for protection on the steel requirements of the two new dreadnaughts upon which the government will ask tenders Nov. 17. Each of these will call for about 14,000 tons of plates, shapes and bars, in addition to the armor plate, and the total requirements of each vessel are placed at 20,000 to 21,000 tons.

Plates Moved Up

Cleveland, Oct. 26.—The plate market is very strong. A leading eastern Pennsylvania company has advanced its quotation to 1.65c, Pittsburgh, and the minimum quotation is 1.50c. Eastern mills are finding it difficult to take any business except universal plates. The demand for deliveries is urgent.

Plates Held at 1.50c

Pittsburgh, Oct. 26.—Under date of Oct. 25, the Carnegie Steel Co. advanced its price of plates, shapes and bars to 1.50c, the highest price to prevail for approximately three years. The Jones & Laughlin Steel Co. has been asking that figure for 10 days and it is not believed tonnage is obtainable at less than 1.50c for shipment the remainder of this year or the first quarter of 1916. Specifications for plates are heavy. It is understood the Norfolk & Western railroad will build 1,000 steel coal cars at its shops in Roanoke, Va. Reports are heard that eastern railroads soon will enter the market for not less than 50,000 steel cars for delivery next year.

Plates on Firm Basis

Chicago, Oct. 26.—Steel plates finally have reached a basis of firmness equal to bars and shapes. One western maker whose plate mills is well filled has quoted 1.69c, Chicago mill, on several inquiries, none of which has yet been closed. Unusually large buying of railroad cars during the past week has notified the market of a tremendous demand for plates which assures enough for all for some time to come. Apparently all shading on plates, which has been the rule in this market for many months, has disappeared and full prices are being obtained. For practically all business already placed, the recent quotation has been 1.64c, Chicago mill.

Forging Billets

Command Extraordinary Prices — Rolling Billets Also High

Philadelphia, Oct. 25.—Extraordinarily high prices continue to be realized on the sales of semi-finished steel, especially forging billets and blooms, by makers in this district. Additional lots of forging steel have been booked at $55 to $60, mill, generally from makers of war supplies and one maker reports a sale at $48, mill. That the demand considerably exceeds the supply is patent, as producers are obliged to turn down numerous requests for prices because they have not the steel at their disposal. While the highest prices heretofore have been made for export and to manufacturers of ammunition, the intense demand and resulting scarcity in forging steel, are causing prices to be raised sharply to domestic consumers whose business is totally apart from war needs. Such prices now rule from $35, mill, upward. It is indicated, regular domestic buyers will pay much higher prices during the approaching quarter for which negotiations soon will be opened. Open hearth re-rolling billets are quoted nominally by eastern producers for the next several months at $32 to $34, mill. An additional sale of about 3,000 tons of Ohio bessemer billets went at approximately $28, delivered, this district. Wire rods also command high figures and recent sales have ranged from $35 to $42, Pennsylvania mill. Inquiries for 50,000 and 10,000 tons respectively of bessemer 4 x 4-inch and 5 x 5-inch billets have come to sellers here from France.

(*For complete prices see page* 868.)

Inquiry From France

New York, Oct. 26.—Two separate inquiries for 100,000 tons each of 8-inch forging blooms for shipment to France have been placed before sellers in this district during the past several days. One of these is for the French government and the other is for a French steel works direct. One of the principal eastern sellers of forging steel now is out of the market this side of February. Prices rule from about $40 to $60, delivered, depending upon the buyer and attendant circumstances.

Sheet Bars Sell at $27

Pittsburgh, Oct. 26.—A heavy tonnage of bessemer sheet bars has been sold at $27, mill, which appears to represent the bottom of the market for shipment the remainder of this year and the first quarter of 1916. Open hearth sheet bars and billets are scarce; makers nominally are quoting the former at $28, mill, Youngstown and Pittsburgh. Demand for forging billets for the manufacture of war material continues heavy and as high as $50 a ton has been paid for some tonnage of special analysis. Wire rods are being held at $34 a ton, Pittsburgh, by some interests, and it is understood that a small tonnage recently was sold at that figure.

Demand for Pipe Improves

Pittsburgh, Oct. 26.—The market for iron and steel pipe shows signs of improvement. It is not improbable that line pipe will be advanced by leading makers in the near future. Prevailing prices are more firmly maintained than at any time for several months. No large orders have been placed this week in the open market.

Industrial Works, Bay City, Mich., has established a Philadelphia office in the Widener building. Complete data and information can be obtained there regarding the Industrial Works line of locomotive, wrecking and freight handling cranes, pile drivers, grab buckets, etc.

Scrap is Strong

In Cincinnati and Other Markets—Dull in Some Centers

Cincinnati, Oct. 26.—Heavy shipments of iron and steel scrap to rolling mills are holding the scrap market at the present level of prices and the tendency is towards a substantial advance before the first of the year. Stove foundries are more active than they have been in eight or 10 months, and jobbing foundries are running at almost full capacities. Dealers report that the accumulation in their yards that was so noticeable about six months ago is slowly decreasing. Demand is best for steelmaking scrap, and cast scrap and stove scrap are next, respectively, in the tonnage being sold and shipped in this territory at present.

Firmer at Chicago

Chicago, Oct. 26.—Although conditions in the scrap market in Chicago are not materially changed and demand has not increased, underlying conditions have stiffened somewhat in keeping with strength in other centers and larger dealings at better prices are expected within a short time. Advancing prices on pig iron are likely to increase the demand for scrap in some places where pig iron is ordinarily used.

Railroad lists are now current as follows: Chicago & Eastern Illinois, 1,100 tons; Rock Island, 3,600 tons; Burlington, 1,900 tons; C., M. & St. P., 3,200 tons; Northern Pacific, 9,000 tons.

Shows Better Undertone

Pittsburgh, Oct. 26.—Iron and steel scrap, which has been comparatively weak and irregular the last two months, shows signs of strength in the Greater Pittsburgh district. Heavy melting steel has sold at $14.75, delivered, and some sellers are asking $15 a ton. No. 1 wrought scrap is being shipped in large quantities to eastern consumers. Low phosphorus steel scrap is selling at about $20, Pittsburgh.

Prices are Firmer

Cleveland, Oct. 26.—Iron and steel scrap prices are stiffening, in line with the advances in all other branches of the trade. Shipments to mills continue heavy, which is a check to a decided advance, but higher prices are looked for generally in the trade. Heavy melting steel is quoted $13 to $13.25, gross ton, Cleveland; $14 to $14.75, Youngstown. Other grades are correspondingly higher. Demand from the rolling mills is better. No. 1 busheling is higher at $11.25 to $11.50. Foundries are taking more scrap. No. 1 machine cast is quoted $11.50 to $12. The heavy demand for steel axles for export to Italy still is affecting the market for this description, quotations in the Cleveland market being around $20 to $22.

Heavy Melting Active

Buffalo, Oct. 26. — Activity in heavy melting steel constitutes the feature of the trading of the past few days, resulting in the price of this line going up 25 cents per ton to $13.25 to $13.75. Large tonnages of heavy melting and other lines were sold. There is a demand for low phosphorus and this scrap is being rapidly taken up by the users.

No. 1 busheling scrap has advanced 50 cents per ton to $10.50 to $11.00 and machinery cast scrap has also advanced to $13.00 to $13.50. There is a fair demand for borings, but the weak feature of the line continues to be machine shop turnings, owing to the immense production of this scrap over the present consumption.

Some Signs of Interest

Philadelphia, Oct. 25.—Certain eastern Pennsylvania steel makers again showed interest in the heavy melting steel market the past week and made offers of $14.50, delivered, or 50 cents under the top price recently paid. Sellers, however, were not impressed with these offers and declined orders. As a whole, the scrap market is no more active than it has been for several weeks and consumers appear to be resting on their recent purchases. Considerable of these former orders yet remains to be covered by brokers and more or less buying of this sort is going on. No. 1 forge has shown a better demand and $11.50, delivered, has been paid. The movement in cast scrap continues good. Other grades show only limited activity. Borings are easier. The Italian government has out new inquiries for 20,000 tons of old rails and other steel scrap. The high ocean freights tend to block orders against these requirements.

Quotations Advancing

St. Louis, Oct. 26.—A much firmer tone is evident in the scrap market in this district, and quotations are advancing rather sharply. The railroads are offering only small lots of scrap, and of this tonnage a good percentage is going to Pittsburgh and valley districts. The mills in this territory all are working full time, and therefore consuming large quantities of scrap. The only railroad offerings this week are: C., B. & Q., 2,000 tons; T. & P., 1,500 tons; St. Louis & S. W., 400 tons.

(For complete prices see page 868.)

Wire Advance

Has Been Made and There is Talk of Still Higher Prices

Pittsburgh, Oct. 26.—Despite the fact that wire products last Thursday were put up to the highest levels to prevail since 1909, talk of further advances is heard. Plain wire now is held at $1.70 per 100 pounds and nails are quoted at $1.85 a keg. Cut nails are listed at $1.70, Pittsburgh. Demand for wire products is tremendous. Mills are not soliciting business and are canceling contracts whenever possible. Large tonnages of barb wire are being shipped to belligerent European nations, and exports of nails, plain and barb wire, to South American and far eastern countries are heavy.

Not Anxious to Contract

Buffalo, Oct. 26.—The heavy demand for steel products of all kinds is noticeable particularly among the wiremakers and selling agencies. Prices have advanced $2 per ton on wire products and the sale of nails is being restricted to 60-day contracts. Jobbers that had been in the habit of placing their orders at this time of the year for their advance needs, for deliveries to meet their spring demands, find that the mills are not inclined to book such business at this time, holding sales down to 60-day contracts.

Additional inquiries from the Canadian markets have appeared for wire rods, but without finding takers, owing to the congested condition of the mills. It is reported that $33.00 per gross ton has been offered.

The Imperial Steel Wire Co., Collingwood, Ont., it is stated, is installing machinery for the manufacture of barbed wire, and that the plant will be in position to turn out 1,000 tons per month before the close of the present year.

Barbed Wire Wanted

C. K. Turner & Sons, 116 Broad street, New York, have inquired for 40,000 tons of painted barbed wire for Russia, shipment to be made to Archangel or Vladivostock. The wire is to be 1/16-inch in diameter with four barbs, 3 inches apart. The same firm also has asked for 20 tons of chrome nickel steel rounds, 3¼ to 1¾ inches in diameter, of 4 per cent chrome; for 80 tons of steel for the center part of armor-piercing bullets, 8 to 10 per cent carbon in bars 10 inches long and for 200 poods each of 6, 7, 8, 9, 10, 12 and 14-inch diameter nickel steel rounds with a minimum of 3½ per cent nickel. A pood is about 36 pounds.

Railroads Ordering Cars

Contracts of Past Week Aggregate 12,000—Russian Government Buys More Rails

New York, Oct. 26.—Active buying by the railroads has resulted in the placing of about 12,000 cars during the past week. The New York Central lines have been the principal buyers, placing within a few days 9,000 additional cars of which 4,500 55-ton gondolas went to the Standard Steel Car Co., 2,000 50-ton steel automobile cars to Haskell & Barker Car Co., and 1,500 and 1,000 of the same type to the American Car & Foundry Co. and the Pullman Co., respectively. This purchase increases the recent buying of the New York Central lines to 14,500. The Baltimore & Ohio has placed 1,000 hoppers with the Cambria Steel Co.,; the Illinois Central, 1,000 refrigerator cars with the American Car & Foundry Co.; the Central of Georgia, 500 freight cars with the American Car & Foundry Co. and 500 box with the Pullman Co. The Chicago & North-Western has entered the market and is credited with figuring on 1,000 gondolas. The additional 7,000 to 8,000 small cars for Russia remain pending, but are expected to be closed soon. A report that they have been taken by the Pressed Steel Car Co. is not correct.

Heavy Demand for Rails

In rails, the Russian government railways have placed an additional order with the Pennsylvania Steel Co. against the 50,000 to 60,000 tons remaining, for which they have been inquiring. The exact tonnage of this order has not yet been fixed. The Wabash has divided 7,000 tons between the Lackawanna and Illinois Steel companies. The former has 5,000 tons additional for the New York Central and will furnish 5,000 tons of the Great Northern order. The International Railways of Buffalo are inquiring for 4,000 tons of 85-pound sections. The Boston & Maine still is figuring on 25,000 tons and the Maine Central on 10,000 tons.

Locomotive orders also are more active. The Illinois Central has ordered 47 mikado type from the Lima Locomotive Corporation and three of another type from the American Locomotive Co. The Lehigh Valley has placed 10 mikados with the Baldwin Locomotive Works. The Central of Georgia, eight mikados and four Pacifics from the Lima Locomotive Co.; the Michigan Central seven Pacifics; the Maine Central, two switchers, and the Toledo Terminal, one consolidation, all from the American Locomotive Co.

Spikes Advanced to 1.70c

Pittsburgh, Oct. 26.—Manufacturers of railroad spikes in the Greater Pittsburgh district have advanced prices $2 a ton and now are asking 1.70c for standard spikes and 1.80c for small spikes. Specifications are coming out in good volume and a number of tentative inquiries are reported, but new buying is not heavy. Demand for steel car wheels continues active; manufacturers in this district are unable to promise deliveries in less than 90 days.

Many Cars Ordered

Chicago, Oct. 26. — Orders were placed during the past week for practically 15,000 railroad cars, constituting the heaviest week's business in car buying in many years. This means practically 150,000 tons of steel in shapes and plates and deliveries on this material scarcely can begin much before the first of the year in the present condition of mills. The business comes from a number of railroads and has been scattered among builders.

Returned to Work

New York, Oct. 26.—With the exception of members of the machinists' union, practically all the 13,000 employes at the Schenectady, N. Y., plant of the General Electric Co., who have been on strike for an eight-hour day, returned to work yesterday. The machinists, numbering 2,500 to 3,000, remained out in accordance with the vote of their union not to accept the agreement between the company and the strikers' grievance committee for a 9½-hour day with 5 per cent wage increase, with an additional 5 per cent increase and a nine-hour day a year from now. The machinists, it is said, will try to start another strike of all the men some time this week.

The plant of the United States Rapid Fire Gun Co., in Derby, Conn., has been purchased by the General Ordnance Co., recently incorporated in Delaware with a capital of $500,000, for about $300,000. The company has been in the hands of a receiver several years. Interests identified with the Submarine Boat Co. control the General Ordnance Co.

(*For complete prices see page* 868.)

Ferro is Easier

On Account of Better Prospects for Increased Shipments

New York, Oct. 26.—Prospects of increased shipments of English ferromanganese to this country, beginning with November, have continued to improve. According to advices, by the makers to their representatives in this country, licenses for 5,000 to 6,000 tons are expected to be granted by the government for November arrival. Imports during October probably will amount to 3,000 to 4,000 tons, which is better than for several months preceding. The steamship DOMINION arrived at Philadelphia within the past week with several hundred tons.

Due undoubtedly to the lessening of the tension as to present and future shipments, the market has displayed an easier tone, especially on early shipment material. Spot metal now is quoted more closely around $100, seaboard. A sale of 100 tons of domestic at slightly less than $100, seaboard, is reported. Forward ferromanganese, both domestic and foreign, generally command $100, seaboard, but an Ohio consumer is said to have obtained several hundred tons at $100, delivered. It is known that in some cases sellers have been dividing their commissions with the purchaser, and this has been accountable for some of the price irregularities. Agents of English makers, as a rule, however, report that they have no difficulty to obtain $100, seaboard, for varying quantities to be delivered up to July 1.

An inquiry for 2,000 tons of spiegeleisen for a steel company which has been current recently, is about to be closed with a domestic maker. This alloy remains $28 to $30, furnace. There is a report that the eastern Pennsylvania maker is about to extend materially its present capacity.

Ferro-silicon Advanced

Pittsburgh, Oct. 26.—Fifty per cent and lower grades of ferro-silicon have been advanced rather sharply. Fifty per cent ferro-silicon is being held at as high as $88 a ton, Pittsburgh, and manufacturers have advanced prices $1.50 a ton for lower grades. Fifty per cent material is being used by concerns making war material and steel casting interests have been playing a more prominent part in the market for lower grades.

The foundry buildings of the defunct A. & H. Foundry Co., Hamburg, Pa., have been sold by the bondholders to M. A. Dunlap, Pottsville, Pa., who is expected to put the plant in operation.

Warehouse Prices

Have Been Marked Up—Business is Very Active

Cleveland, Oct. 26. — Warehouse business continues very active in Cleveland and another advance of $2 has been made on shapes, plates and bars, which are now quoted as follows: Steel bars over 2-inch, 2.35c, under 2-inch, 2.10c; iron bars, 2.05c; shapes and plates, 2.20c; No. 10 blue annealed sheets, 2.25c, an advance of 5c. No. 28 black sheets and galvanized sheets have not been changed.

Warehouse Business Brisk

Chicago, Oct. 26.—Demand for steel products from store is increasing steadily, as deliveries from mills become more deferred. However, this condition is not producing as strong a demand on warehouses as ordinarily would be the case with equal activity at mills. This is an effect of the strong foreign demand which, of course, has no effect of pressure against warehouse stocks. Domestic business seems to be strongly on the increase and large business for warehouses apparently is a matter of the near future. Quotations on steel products from store remain unchanged.

Higher at Philadelphia

Philadelphia, Oct. 26.—A further advance of $1 to $2 a ton has been made in warehouse prices in this territory. Plates, shapes and bars in store now are quoted at from 1.95c to 2c per pound, at the warehouse, with about $1 per ton extra for hauling. The demand for warehouse products is active.

Southern Ohio Iron Advanced

Cincinnati, Oct. 27. (By wire.)—The Hanging Rock Iron Co., Hanging Rock, O., today advanced the price of No. 2 and malleable pig iron to $16 for this year or first half. There is no basic to offer this year. The price for next year is strong and uncertain. The Marting Steel & Iron Co. is out of the market this year and for first quarter on all grades.

Labor Agitator Convicted

Cleveland, Oct. 27.—It is estimated that from 4,500 to 5,000 machinists employed in five large manufacturing plants of this city are now on strike for the 8-hour day at 10 hours' wages. The firms affected by the strike include Warner & Swasey, Bardons & Oliver, the Peerless Motor Car Co., the Standard Tool Co. and the National Acme Mfg. Co. The latter firm has been picketed by the strikers. Many of the men who walked out, it is declared, are anxious to return to work, employers stating that no less than 1,350 men have expressed such a desire. A labor agitator who has been conspicuous in fomenting the trouble has been sentenced to 30 days in the workhouse for assault and battery on the person of a non-union workman, and other similar charges, it is said, will be preferred against him.

Many Volumes

Must be Reduced to Few in Steel Corporation Case

Washington, Oct. 27. (By wire.)—The appeal to the Supreme Court by the department of justice of the government's suit to dissolve the Steel Corporation is nearly ready for filing, which may be done this week. The appeal will comprise a statement of alleged errors made in the decision by the lower court and perhaps will analyze such statement in an effort to show that the law was misinterpreted and the decision, therefore, should be revised.

The testimony makes over 50 volumes and must be reduced to three or four. It will require several months to condense. Arguments on appeal will be made after the testimony is abstracted properly and it may be spring before this is done.

Midvale Additions

An additional blast furnace and a bar mill, it is learned upon good authority, are planned by the Midvale Steel & Ordnance Co., to be erected on an extensive tract of land recently acquired adjoining the blast furnaces of the Worth Bros. Co., Coatesville, Pa., now owned by this corporation. The bar mill will be devoted chiefly to the production of large rounds for shrapnel. At the present time, the Worth plant comprises two blast furnaces and the rolling equipment consists of plate mills with their complements of blooms and slab mills.

The Youngstown District

The board of directors of the American Iron and Steel Institute at a recent meeting in Cleveland voted to change the name of the district known for years as "the valleys" to the "Youngstown district" in connection with compilation of statistics by the institute bureau.

(For complete prices see page 868.)

Firm Tone

Prevails in Non-Ferrous Market—Copper Demand Light

New York, Oct. 26.—Practically all the metals have reflected a firm tone during the week closing today and all have shown a rising tendency in prices with the exception of copper and aluminum. Copper has been in fair demand right along, but the volume of buying for some time has been much below the production, with the result that some producers have been tempted to sell at concessions. Quotations now are as follows: 17.75c to 18c, delivered 30 days, on electrolytic; 17.62½c to 17.87½c, delivered 30 days, on the best brands of casting copper; 17.12½c to 17.37½c, cash, on ordinary casting copper; 18.12½c to 18.25c, cash, on the best brands of lake copper; 17.87½c to 18c, cash, on ordinary lake copper, and 17.75c to 17.87½c, cash, on arsenical lake.

Spelter, due to an improvement in foreign and domestic demand, and advances in the London prices, is held higher here. Today, due partly to a decline of £1 in London, the tone of the market is somewhat easier. Prime western is quoted at 14.50c to 14.75c, St. Louis, for October, 14c to 14.25c for November, 13.25c to 13.50c for December, 12c to 12.50c for first quarter and 11.50c to 12c for first half.

Lead is exceedingly firm. During the week the American Smelting & Refining Co. advanced its asking prices to 4.75c, New York, and 4.67½c, St. Louis. The outside market now is quoted at approximately the same figures. Good export bookings of lead have been entered lately.

Demand for tin has been rather good all through the week, at advancing prices. Today, however, consumers are not showing a great deal of interest. Importers quote 33.62½c to 33.75c for prompt and are inclined to ask somewhat higher for futures.

Prices on antimony have gone up sharply, due to the interruption of traffic through the Panama canal, thus holding up arrivals of the metal here. Spot stocks are scarce and closely held. Spot Chinese and Japanese are quoted nominally at 34c to 35.50c, duty paid, while domestic antimony is nominal at 33.50c to 34.50c.

The aluminum market is very firm and No. 1 ingots in carload lots are quoted at 54c to 57c.

The J. Morton Poole Co., Wilmington, Del., has sold its entire plant and equipment to E. I. du Pont de Nemours & Co., and has discontinued business.

Practical Policies

Will be Discussed at New Orleans Trade Convention

James A. Farrell, president of the United States Steel Corporation, has issued a call for the third National Foreign Trade Convention to be held in New Orleans on Jan. 27, 28 and 29. The convention will be held under the auspices of the National Foreign Trade Council, of which Mr. Farrell is chairman. The motto of the convention will be "Commercial Preparedness". "All Americans engaged in or desirous of entering oversea commerce are invited," says the call, "to participate in this practical and constructive discussion of policies and practices necessary to meet the keener competition which the United States may expect to encounter in world markets after the war. The rehabilitation of the American merchant marine, the utilization of the tariff to encourage American foreign trade and protect it from discrimination, the adaptation of commercial education to the needs of foreign trade, and ways and means for the smaller manufacturers and merchants to engage in and share the benefits of foreign trade, will be considered from the standpoint of the chief elements in foreign trade, namely, natural products and agriculture, manufacturing, merchandizing, transportation and finance."

Inquiries for Machine Tools

C. K. Turner & Son, manufacturers' export agents, 116 Broad street, New York, have received cabled inquiries for machine tools, as a result of which they are in the market for the following: Ten turning lathes, 20 to 24-inch swing and 5 to 6-foot bed; 40 automatic and revolver lathes, ¼ to 2-inch spindle, for early shipment to Archangel; 25 lathes, 8 to 9-inch center and not less than 40 inches between centers, for delivery to Petrograd in six weeks or earlier; 38 turning screw cutting lathes, Norton type; 40 plain head turret screw machines, Warner & Swasey No. 2 size or similar, with automatic chuck bar feed, hand longitudinal feed for cutting off and overhead chasing attachment; five automatic flat turret lathes with 40-millimeter spindle; 10 revolver lathes, Greenlee type; 40 screw lathes with geared friction head. Prices, delivery, illustrations wanted in duplicate.

Columbus Plant Sold.—The plant of the Columbus Machine & Tool Co., Columbus, O., has been sold to Indiana men, whose names are not announced. The deal was arranged by H. L. Hopwood, industrial attorney, and the business will be actively conducted. Considerable new machinery has been installed.

Schwab's Offer

For Purchase of Pennsylvania Steel Co. Not Yet Accepted

A hitch has taken place in the proposed purchase of the Pennsylvania Steel Co. by Charles M. Schwab and associates of the Bethlehem Steel Corporation and doubts are beginning to be entertained whether the transaction will be consummated in the near future, if at all.

The difficulty, it is understood, relates to the unwillingness of some of the large holders of the Pennsylvania Steel stock to accept the price and terms of payment offered by Mr. Schwab. One of the dissenters is said to be the Reading Iron Co., which is the holder of about 90,000 shares of the common stock of the steel company. Following a meeting of the Reading company, the parent corporation, including the Reading Iron Co. at Philadelphia a few days ago, E. T. Stotesbury, president of the Reading company, announced that no action had been taken whereby the Reading Iron Co.'s stock holdings were to be sold.

With the apparent hold-up of Mr. Schwab's negotiations, there has been a revival of the familiar report that the syndicate, headed by W. H. Donner, president of the Cambria Steel Co., and chairman of the Pennsylvania Steel board, again is considering the taking over of the majority stock holdings of the Pennsylvania railroad in the latter company looking toward the eventual amalgamation of the two steel companies.

Carrying Out Plans

Warren, O., Oct. 26.—The Trumbull Steel Co. is planning the erection of the eight additional sheet mills, provision for which was made in August, as heretofore announced, when stockholders voted to increase the capital stock from $2,500,000 to $4,000,000. Of the eight mills two will be jobbing mills and the remainder probably will be divided equally into tin and sheet mills, three of each, although this is not decided definitely. The company is about to enter into the manufacture of blue annealed sheets of all standard sizes. The Riter-Conley Construction Co., Pittsburgh, has taken the contract for the buildings, while the contracts have not been let for the mills. Jonathan Warner is president of the company, which began to operate in November, 1913.

PERSONALS

Wm. B. Dickson, former vice president of the United States Steel Corporation, and recently elected secretary and treasurer of the Midvale Steel & Ordnance Co., has been made a director of the Colorado Fuel & Iron Co.

L. Selmi, chief chemist-metallurgist of the Otis Steel Co., Cleveland, has resigned, effective Nov. 1, when he will take charge of the chemical and physical laboratories of the new steel plant of Corrigan, McKinney & Co., that city.

R. B. Bostwick, superintendent of the open hearth steel department No. 3 of the Homestead works of the Carnegie Steel Co., has resigned to become associated with the Upson Nut Co., Cleveland. His resignation will take effect Nov. 1. T. J. Jamison has succeeded Mr. Bostwick at Homestead.

H. H. Westinghouse was elected president of the Westinghouse Airbrake Co., Wilmerding, Pa., at the annual meeting of stockholders last week. Cyrus S. Gray, E. M. Herr, A. L. Humphrey, J. R. McGinley, Charles McKnight, John F. Miller, Morris S. Rosenwald, W. D. Uptegraff and H. H. Westinghouse were elected directors.

R. H. Stevens, chief mechanical engineer of the Homestead Steel Works of the Carnegie Steel Co., has resigned to accept a similar position with the Midvale Steel & Ordnance Co., Philadelphia, of which Alva C. Dinkey, former president of the Carnegie company, is president. Mr. Stevens was connected with the Carnegie company for about 30 years. A. W. Soderberg, assistant mechanical engineer at the Homestead works, was promoted to fill the vacancy caused by Mr. Stevens' resignation.

Obituaries

Colonel Thomas Edward Vickers, a pioneer in the British armament industry, died Oct. 19, in England, aged 83 years. He was managing director of the Vickers, Maxim Co. for 43 years and chairman for 37 years, resigning in 1910. His early education was received in England and Germany.

George P. Fenner, president and treasurer of the Babcock Printing Press Co., New London, Conn., was killed instantly Oct. 21, when a touring car which he was driving and which contained three other passengers was struck by an unknown automobile while passing through Waterford in that state. J. Thomas Hudson, another New London man who was in the car, died the following day from injuries received. Mr. Fenner was 55 years old and prominently known in the manufacturing world.

Heart Felt Tributes to F. W. Taylor

By Men Who Knew Him Well—Meetings at University of Pennsylvania—Grave and Home Visited

Philadelphia, Oct. 26. — Tributes were paid to the memory of the late Frederick Winslow Taylor, father of scientific shop management, at the memorial meeting of the Society to Promote the Science of Management held here last Friday evening and Saturday. The sessions were presided over by President Harlow S. Person, of the society, and in addition to the members of the society were attended by manufacturers who have introduced the elements of the Taylor system in their plants and some 100 employes who are working under the system. The opening exercises were held in the chapel of Houston hall at the University of Pennsylvania, when a number of eulogies were delivered, followed on Saturday with a visit to "Boxly", the home of the late Mr. Taylor in Chestnut Hill, a trip to his grave, where a benediction was pronounced, and a business meeting and delivery and discussion of a paper on "Personal Relationship as a Basis of Scientific Management", prepared by Richard A. Feiss, of the "Clothcraft Shops", Cleveland. The business meeting and delivery and discussion of Mr. Feiss' paper, as well as an informal reception, luncheon and dinner, took place at Hotel Adelphia, which was headquarters for the society.

There were present at Houston hall 500 people, some of them compelled to stand up, and included in the audience were numerous women. The services were impressive and signified the high esteem in which Mr. Taylor was held, both as an individual and as the originator and expounder of a doctrine that has proven and is proving to be the means of greatly increased industrial efficiency.

The opening expression in honor of the memory of Mr. Taylor was given by Prof. Edgar F. Smith, provost of the university. His tribute was delivered in behalf of that institution, which, nine years ago, conferred upon Mr. Taylor the honorary degress of doctor of science. In terms of laudation, Prof. Smith referred to Mr. Taylor, "adopted son of the university", as having given enlightenment in the field of economics, and in reciting his numerous activities in the industrial line praised him for his engineering skill and for his work in organizing his plan of scientific shop management. His example was declared to be one well worth emulating by students of the university who seek to become leaders in the world of affairs. Moreover, Prof. Smith asserted that the ideals toward which Mr. Taylor strove so earnestly should be advanced.

Guardian of Truth

In his introductory remarks, President Person spoke of Mr. Taylor as the guardian of truth, a leader and an educator.

"He had an unquenchable desire to learn the truth," said Mr. Person, "an intense indefatigability to attain it, and patience and humility which forbade him committing the sin of arriving at premature results." His philosophy of management was declared to be "one of the most heroic stones in science.

"It thrills us in our generation," he continued, "to know that we have touched the living body of such a man, of such an investigator." Although Mr. Taylor had passed away, said Mr. Person, he has left an example that will live and grow forever. It was asserted that his system "seems as plain and obvious as the egg of Columbus, but nevertheless it is an innovation."

Mayor Rudolph Blankenburg said Mr. Taylor became the world's foremost industrial leader. He said he could not express in a better way his appreciation of Mr. Taylor than to say he had endeavored to persuade him to become a member of his cabinet, and attributed the appointment as director of the department of public work of Morris L. Cooke to Mr. Taylor's influence.

"Mr. Taylor pursued problems with the zest of a hunter," said Mayor Blankenburg, "and the world has been listening to him for years as a master mind." Reference was made to the fact that Mr. Taylor's works have been translated into foreign tongues and then were read the tributes to Mr. Taylor that came from Charles de Freminville, of Paris, and A. Wallichs, of the Royal Polytechnic school, Aix-la-Chapelle.

The paper from Prof. Wallichs said the essence of Mr. Taylor's doctrine was the bettering of conditions of the laboring class and the increasing of wealth. His work, said Prof. Wallichs, will find a welcome in Germany, where its influence had already been felt. Prof. Wallichs said that when he first learned of Mr. Taylor's work, he thought it was that of a German, because of its thoroughness and scientific mastery of every detail.

"I was surprised to find," he said, "that the doctrine originated in America."

A paper on "How I Have Known Frederick W. Taylor; Why I Have Endeavored to Popularize Scientific Management", by Henri Le Chatelier, of the Institute of France, was presented by Colonel Vignal, military attache of the French embassy, Washington. It was declared that conflicting statements had been issued in France by labor unions as to the Taylor system, some praising and others condemning it. In France, it was pointed out, the most bitter opponents to the system are "economists who formed their ideas without studying the question." Mr. Taylor's doctrine was lauded, and the assertion made that it is making progress little by little in France.

A resume of the development of Mr. Taylor's work was given by Carl G. Barth, Henry L. Gantt and Sanford E. Thompson, formerly associated with Mr. Taylor. The papers constituted a symposium tracing in consecutive order Mr. Taylor's work, which began when he was with the Midvale Steel Co. Mr. Gantt's subject was "The Midvale Period". Mr. Gantt said he became associated with Mr. Taylor when the latter began developing characteristics which were to make him famous.

Mr. Thompson spoke briefly on "The Stages Between Midvale and Bethlehem", and in the course of his remarks traced Mr. Taylor's activities which began as an engineer and ended as a scientist.

"The industrial world," said Mr. Thompson, "is gradually growing up to the level attained by Mr. Taylor 20 years ago. He was a generation ahead of his time."

Mr. Barth spoke on the subject "Bethlehem and Other Work to the Present Time", and referred to Mr. Taylor's experiments when with the Bethlehem Steel Co., in connection with the cutting of metals, something which, it was said, was developed into an art. Mr. Taylor's great patience and confidence in his experiments were described as being prominent characteristics of the man.

Steady Increase

Shown in Earnings of the United States Steel Corporation

Net earnings of the United States Steel Corporation for the third quarter of the year ending Sept. 30, were $10,760,589 greater than for the second quarter and totaled $38,710,644. While they did not reach some of the over-optimistic predictions that had been made, they displayed a steady increase monthly of $800,000 to $900,000 and were the highest in September of any month since May, 1913. After the setting aside of the fixed charges and the preferred dividend of 1¾ per cent payable Nov. 29, to holders of record Nov. 1, a balance of $18,037,241 remained to apply to the common shares. No action was taken by the directors, however, towards restoring the common stock to a dividend basis. With the $8,267,645 netted for the second quarter of 1915, this increases the total surplus since March 31 of this year to $26,304,886, or considerably more than sufficient to take up the total deficit of $23,355,546 made up from surplus to pay dividends during the five preceding quarters, when they were not earned.

The net earnings for the past quarters, or since Jan. 1, 1914, are as follows:

Sept. 30, 1915	$38,710,644
June 30, 1915	27,950,055
Mar. 31, 1915	12,457,809
Dec. 31, 1914	10,933,170
Sept. 30, 1914	22,276,002
June 30, 1914	20,457,596
Mar. 31, 1914	17,994,381

The detailed financial statement for the third quarter is as follows:

EARNINGS.

	Earn. before chg. int. on the sub. Cos.' bonds.	Less: Int. on the Sub. Cos.' bonds outstanding.	Balance of earnings.
July, 1915	$12,832,890	$ 784,672	$12,048,218
Aug., 1915	13,647,891	778,792	12,869,099
Sep., 1915	14,569,652	776,325	13,793,327
	$41,050,433	$2,339,789	.....
Total earn. after deduct. all exp. incident to oper.			$38,710,644
Less, chgs. and allow. for deprec.	$7,028,034		
To sink. funds on U. S. Steel Corp. bonds	1,636,819		
			8,664,853
Net income			$30,045,791
Deduct: Int. for quar. on U. S. Corp. bonds outstanding	$5,458,495		
Prem. pay. on bonds redeem. under sink'g funds	245,136		
			5,703,631
Balance			$24,342,160
Div. for quarter on stock, prfd., 1¾ per cent			6,304,919
Surp. for the quarter			$18,037,241

New Plant Operating.—A new zinc plant of the American Steel & Wire Co. at Donora, Pa., work on which started about three months ago, has commenced operations in part. The plant is a 10-unit one and will have 912 retorts to each unit when completed. The capacity of the plant is estimated at 40,000 tons of spelter a year, aside from a large amount of sulphuric acid.

Sheet Prices

For First Quarter Announced—Bolts, Nuts and Rivets Higher

Pittsburgh, Oct. 27. (By wire.)—Demands of consumers anxious to cover future needs have led the American Sheet & Tin Plate Co. to open books for steel sheet products for first quarter delivery on the following basis: No. 10 blue annealed, 1.80c; No. 28 galvanized, 3.65c; No. 28 American black sheets, 2.25c. These quotations, which are the highest to prevail for 30 months, probably will represent the bottom of the market, since some mills already have asked higher prices for future delivery. Blue annealed sheets for spot delivery have been offered at 1.70c, and black sheets are being sold at 2.20c for nearby shipment. On open hearth steel black sheets, as high as 2.35c is being quoted for first quarter.

Effective today, nut, bolt and rivet makers are sending out new price schedules showing advances of from 12 to 15 per cent on nuts and bolts and $7 a ton on rivets. Button head structural rivets are being held at $2.25. Recent advances for steel stock led to the adoption of higher prices by nut, bolt and rivet makers.

Rails Bought

By Boston and Maine—Plans for Portable Houses

New York, Oct. 27. (By wire.)—The Boston & Maine railroad has closed for 25,000 rails, a large part of which went to the Lackawanna Steel Co.

Designs for portable houses have been submitted to leading officials of belligerents abroad. Action there on these propositions is expected in November.

Boats for Norway

The American Ship Building Co., Cleveland, has closed a contract for two full Welland canal-size ships for Norwegian owners, to be built for delivery next June. Negotiations are pending for more ships of the same type. This is the first time that a ship has ever been built on the lakes for foreign account. Several Welland canal-size boats for ocean service have been built on the lakes for American buyers, but the lakes have never been able to compete with English yards.

Many Strikes

Are Pending, While Some Others Have Been Settled

Hearings by the Massachusetts state board of conciliation and arbitration of conditions surrounding labor difficulties, principally among the machinists, in Worcester, Mass., have been concluded by the presentation of testimony by heads of some of the largest industrial establishments in that state. The board will review all the evidence it heard during the eight days' sessions and prepare a report, which will contain recommendations for the solution of controversies in shops where there have been strikes, walkouts and lockouts. The manufacturers refuse to arbitrate and the only solution left is for them to deal with the men individually, which course they say they are willing to follow.

Machinists and machine shop employes with workers in other departments of the Crompton & Knowles Loom Works, Worcester, Mass., at a mass meeting Friday night, attended by about 700, voted unanimously to walk out at 10 a. m. today (Oct. 28) unless the corporation accedes before then to the demands for shorter hours and more pay. President Charles H. Hutchins, of the corporation, addressed the men Friday afternoon and told them that it is impossible to grant the demands for the reason that its six largest competitors are running 55 hours a week and it couldn't compete with them on a 48-hour basis. He also informed them that it is absolutely essential that the corporation continue to run an open shop.

The strike of machinists at the New Britain Machine Co., New Britain, Conn., has been settled, the men returning to work Monday morning. The union voted to declare the strike off at a meeting Thursday night. It claims to have gained an important point in the strike and that is that the company will accept an employe if he shows his union card. It says a man belonging to the union would not be discriminated against by the company, but would get a job just as quick as one who did not. From the public standpoint, the strike is regarded as a failure. The men struck for an eight-hour day with increased pay, but get neither.

Fifty-seven molders employed by the Builders Iron Foundry, Providence, R. I., are on strike. They demanded 50 hours a week and $3.50 a day for journeymen. The foundry has been operated on a 55-hour schedule. The new wage demanded is nearly the same as the old rate.

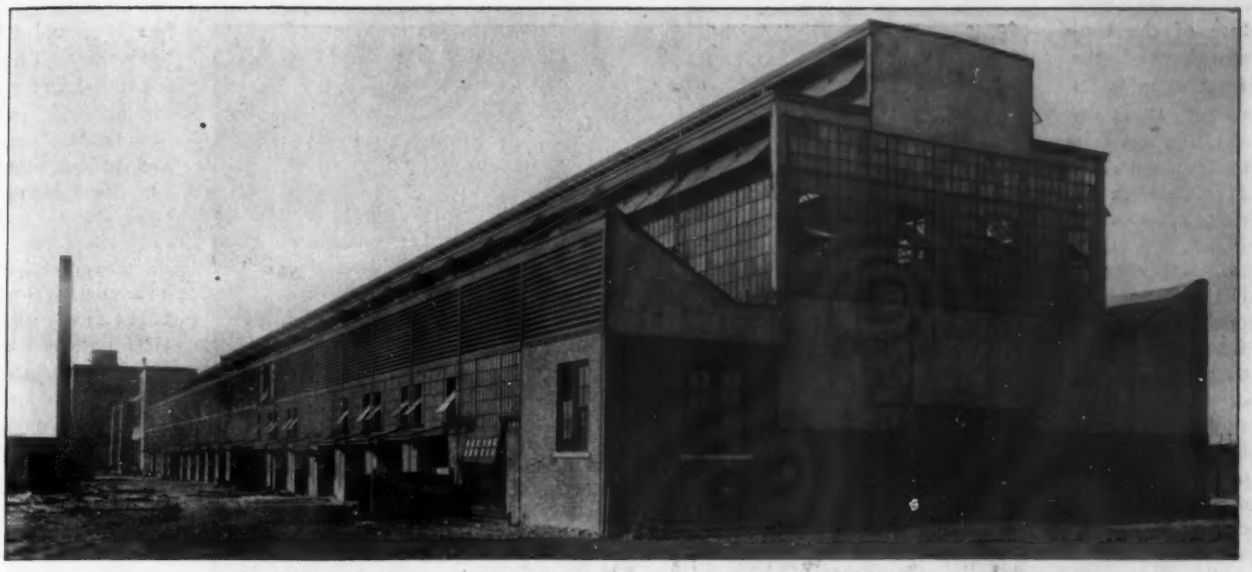


Fig. 1—Forge Shop of Packard Motor Car Co., Detroit, Showing Stamping Shop, Die Shop and Boiler Plant at Rear

A Modern Automobile Forge Shop

Interesting Structural Methods Eliminate Furnace Smoke and Gases—Heavy Truck Axles Drop Forged in Two Operations—Shop Makes Its Own Dies

BY F. A. CHURCHILL JR.

THE bewildering growth of the automobile industry has created in its many departments, emergencies which have resulted in countless discoveries of great value, not only to the industry they were primarily intended to develop, but to many others as well. The automobile engineer has from the first been unhampered by tradition and has obeyed the demand which existed in the saving of time in manufacture and in the increase of output, regardless of initial expense. In his researches for lighter, stronger steels for axles and springs, in his refinements of shop practice and the development of standardization he has been given practically a free hand. The results have justified their cost many times over. Today, therefore, the advances in methods and improvements in materials constantly being made in the great automobile factories are watched keenly. An excellent example of this industry's contributions to practical science is found in the development of exact data regarding the properties of alloy steels. Another example, of even more recent interest, is the application of heat treatment theories, which are engrossing the attention of many steel experts.

As may well be imagined, the automobile manufacturer has not suffered his buildings and tool equipment to fall behind the pace set by the evolution of the manufacturing methods employed. In most cases the growth of individual plants has been too recent and rapid to permit of any but the most modern practice in construction and in the arrangement of machinery. As an example of how production methods are worked out by the largest automobile makers, the forge shop of the Packard Motor Car Co., Detroit, is of interest. Housed in a modern steel structure of unusual construction, this department, employing 350 men, produces more than 1,200,000 pounds of forgings every month. In conjunction with the stamping shop, which is situated in an adjoining building, it manufactures a wide variety of metal parts for Packard trucks and pleasure cars, ranging from 140-pound drop forged axles to wheel hub flanges and gear shift levers. One fea-

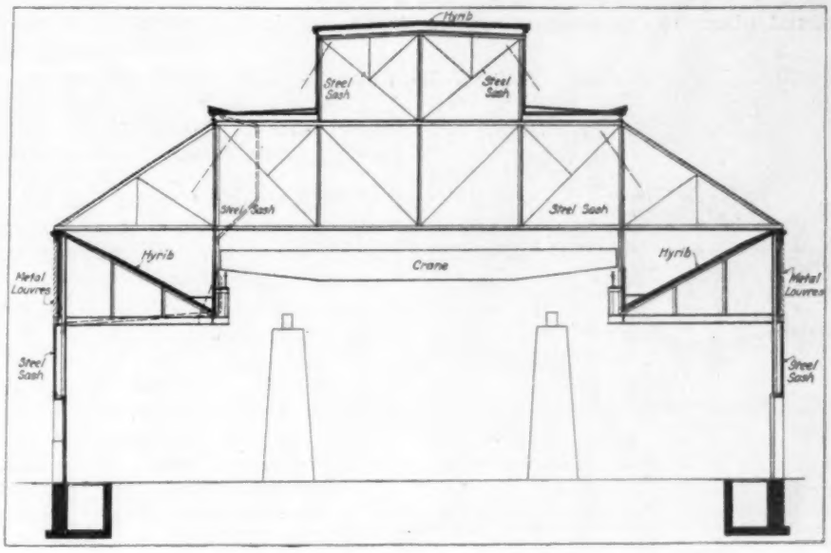


FIG. 2—TRANSVERSE SECTION OF FORGE SHOP

ture of the construction of the forge shop is its unique roof design, illustrated in the sectional view, Fig. 2, and in the exterior view, Fig. 1. To afford satisfactory ventilation for the nearly two score forges and furnaces at the sides of the shop, the roofs of the side bays are inclined upward at a sharp angle, this construction preventing smoke and hot gases from entering the main bay, thus materially increasing the comfort of the cranemen and other employes. Steel sash and metal lath construction have been used throughout. The draft over the furnaces is furnished by several large Sirocco fans, operated by electric motors, the air passing out through metal louvres, as shown in Figs. 1 and 2.

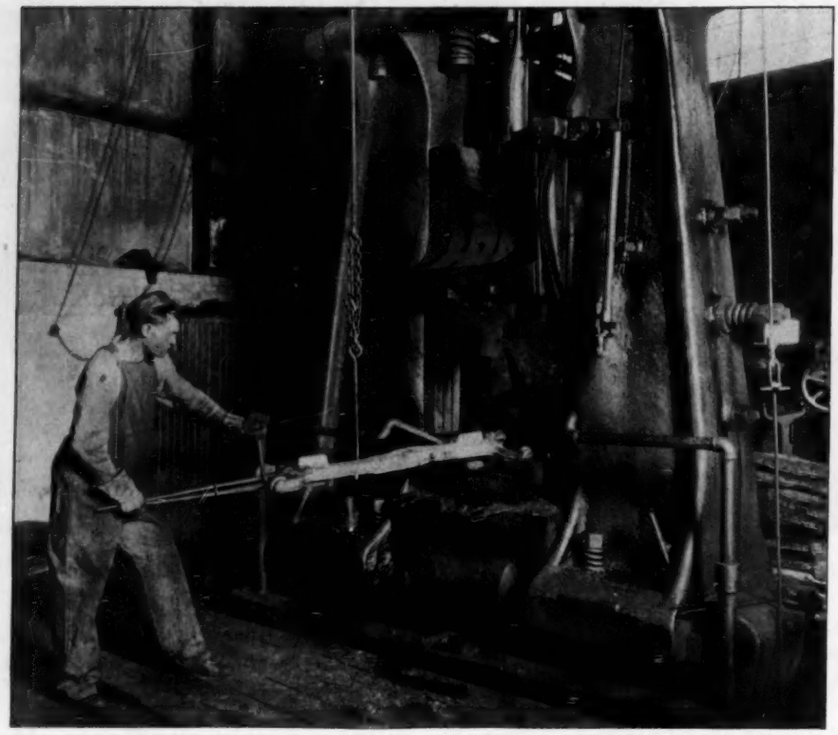


FIG. 3—STRIKING OUT END SECTION OF HEAVY DROP FORGED TRUCK AXLE

Of especial interest among the various forging processes is the manufacture of the 140-pound, drop forged, I-beam section, alloy steel axle for the Packard commercial truck. This is accomplished in two operations. In the first, the heated blank is struck out in one of the larger steam hammers by means of a triple die, the three parts of which finish the end of the axle as shown in Fig. 3. The secondary process, which takes place in a large press as shown in Fig. 5, trues up the central I-beam section of the axle. Fig. 6 shows the forging of Packard engine cam shafts.

The forge shop is 360 feet in length and 72 feet wide, its main bay being 44 feet high. The outside height of the side bays is 24 feet, their inside height is 16 feet, and their width is 16 feet. At one end of the forge shop and adjoining it, as shown in Fig. 4, is the stamping shop, 130 feet long and 72 feet wide. This building has two stories, the upper being used as a die manufacturing shop. Office space is provided in the lower floor for the foreman, bookkeepers and assistants. The stock shed, also shown in Fig. 4, is constructed of steel and metal lath according to modern design, and is 192 feet long and 72 feet wide. The stock includes stamping and forging steel bars and blooms, and oil. Between the forge shop and stock shed is a die storage room, illustrated in Fig. 7. More than 4,000 sets of dies for the hammers and presses are kept in this room, arranged on steps and marked so as to be readily accessible. This arrangement is declared to constitute a great improvement over the old method of placing the dies in racks, which was provocative of much trouble, not only in finding the proper dies, but in getting them out when once discovered. A central rack is still maintained, but, as shown in Fig. 7, it is so constructed as to be comparatively easy of access. The dies are handled by means of a trolley crane, as illustrated in Fig. 7.

The forge department is served by its own steam plant, shown at the rear of the forge shop in Fig. 1. The present boiler capacity of the steam plant is 4,000 horsepower, which is to be materially increased in the near future. Steam is brought to the various machines in the forge shop by means of a tunnel.

The equipment of the forge shop includes 17 Niles-Bement-Pond steam

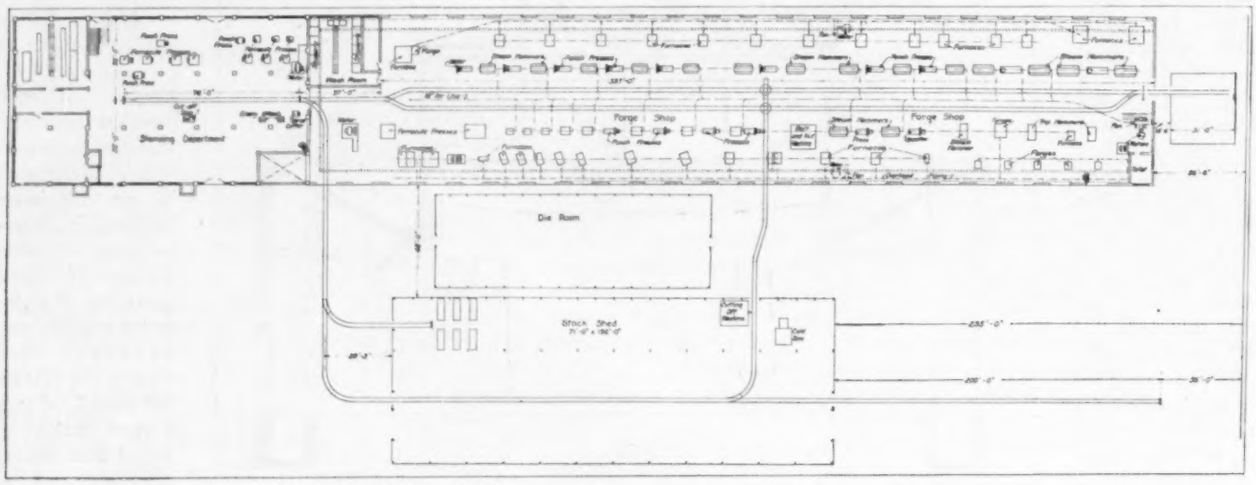


FIG. 4—FLOOR PLANS OF PACKARD MOTOR CAR CO. FORGE DEPARTMENT

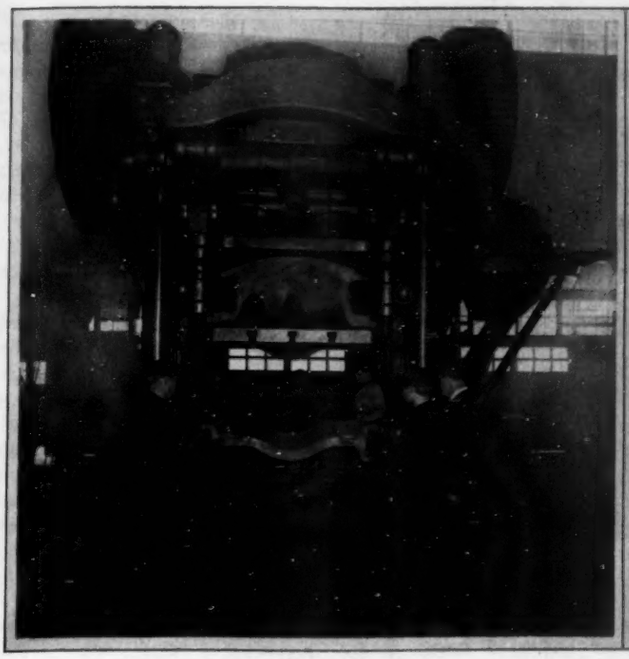


FIG. 5—TRUEING UP I-BEAM SECTION OF TRUCK AXLE IN FORMING PRESS

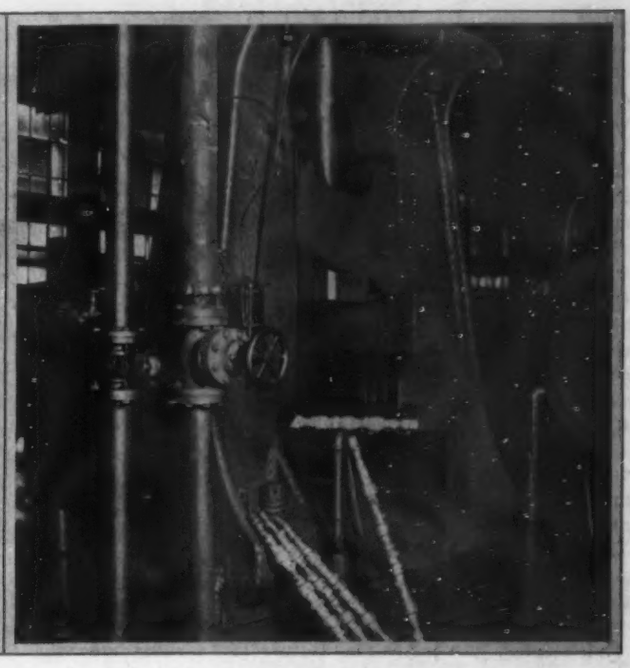


FIG. 6—FORGING CAM SHAFTS FOR PACKARD ENGINES

hammers, ranging from 4,000 pounds to 1,500 pounds; two Bradley trip hammers of 300 and 200 pounds respectively; one Acme bolt and nut machine; one 4-inch Acme upsetter; eight Bliss board-drop hammers ranging from 2,000 pounds to 600 pounds; one 1,000-ton and one 500-ton Ferracute press; and 14 smaller Bliss presses, arranged so as to serve the hammers and driven by electric motors of from 11½ to 30 horsepower. All the machines in the shop are set on extremely heavy concrete foundations, their arrangement being shown in Fig. 4. The 10-ton Northern crane which serves the shop is shown in Fig. 9. In this illustration the 1,000-ton Ferracute punch press is visible in the foreground at the right; behind it is seen a line of board drop hammers. The steam hammers shown at the other side of the shop in Fig. 9, range from the smaller hammers in the foreground to the 4,000-pound installations at the extreme rear. Two Erie 8,000-pound steam hammers are to be added to the shop equipment in the near future. The 36 forge furnaces which serve the hammers and presses are gas fired, having been designed by the Packard company to meet its own requirements.

In addition to the equipment described above, a Hilles & Jones shear with a capacity of 4½-inch rounds, shown in Fig. 8, and two Newton cold saws with a capacity of 3 x 7 inches, installed in the stock shed, facilitate the handling of material. A larger Hilles & Jones shear, with magazine attachment to handle four bars at one operation, is to be added. Both shops are served by a narrow gage track which traverses the

FIG. 7—PACKARD DIE ROOM SHOWING CONVENIENT ARRANGEMENT OF DIES ON RACKS

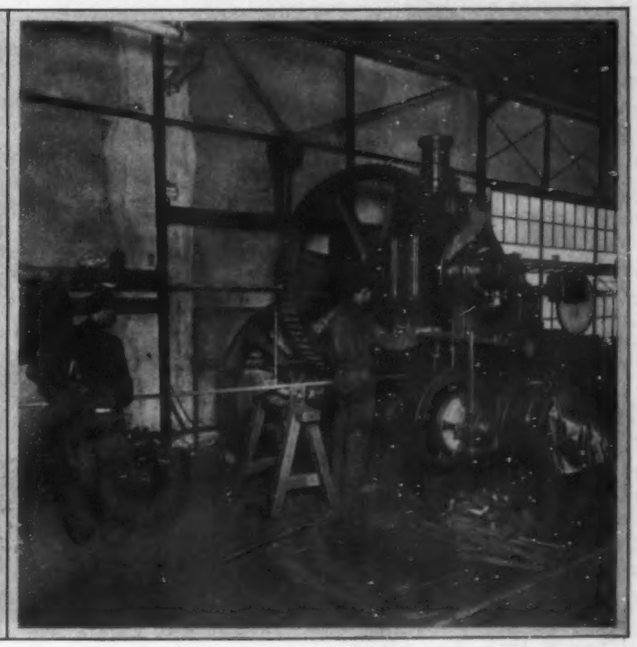


FIG. 8—HEAVY SHEAR IN STOCK SHED

entire length of the stock shed and passes over a weighing device directly in front of the shear, permitting the weighing of material immediately before it is used. A narrow gage track traverses the stock shed and enters the forge shop, a spur from the Detroit belt line railroad providing access to the various railroad lines. The stock is handled by means of a 10-ton Northern crane with a 3-ton magnet. An interesting feature of the stock shed equipment is a large gas furnace near the shear and cold saws, which is used to heat alloy steels preliminary to the cutting of gear blanks, etc. This furnace, which has a capacity of 20 tons per day, was designed and constructed by the Packard company. Among the products of the stamping shop, which is operated in conjunction with the forge shop and which is shown in Fig. 4, are wheel hub flanges, cross members, and scores of smaller parts. Metal up to 3/8-inch in thickness can be formed by the larger presses in this shop. The

(*Continued on page* 868b)

FIG. 9—INTERIOR OF FORGE SHOP SHOWING STEAM HAMMERS AND HEAVY PUNCH PRESS

Portable Riddle of Novel Design

A PORTABLE, gyro-reciprocating riddle built like a wheelbarrow is manufactured by the Champion Foundry Machinery Co., Chicago. As shown in Fig. 1, the machine is equipped with three legs, the third leg terminating in a loose wheel, the axle of which operates in a cam slot. When it is desired to move the riddle, the leg is lifted and the wheel drops into place of its own weight, so as to enter the cam and bear the weight of the machine. As illustrated in Fig. 2, the arms which support the riddle shaker are used also as wheelbarrow handles. It is claimed that the three legs of the machine, resting solidly on the floor at divergent angles, insure freedom from shifting due to vibration from the motor. The riddle is operated by a ¼-horsepower motor using current from any lamp socket. Power is transmitted by a steel worm and cast iron gear to a one-piece steel crank connected to the steel arm directly over the motor. This arm works on a simple roller bearing, consisting of two hardened steel runways between which is a 1-inch steel ball. A standard 18-inch hand riddle is held rigidly in a steel frame with no clamps or any other mechanism.

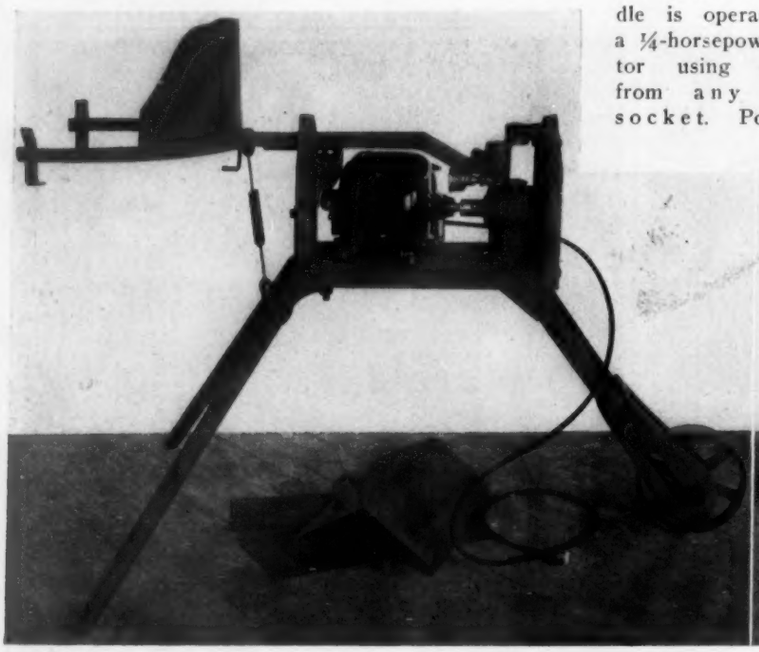


FIG. 1—PORTABLE, GYRO-RECIPROCATING RIDDLE WITH SAND-PROOF COVERS REMOVED

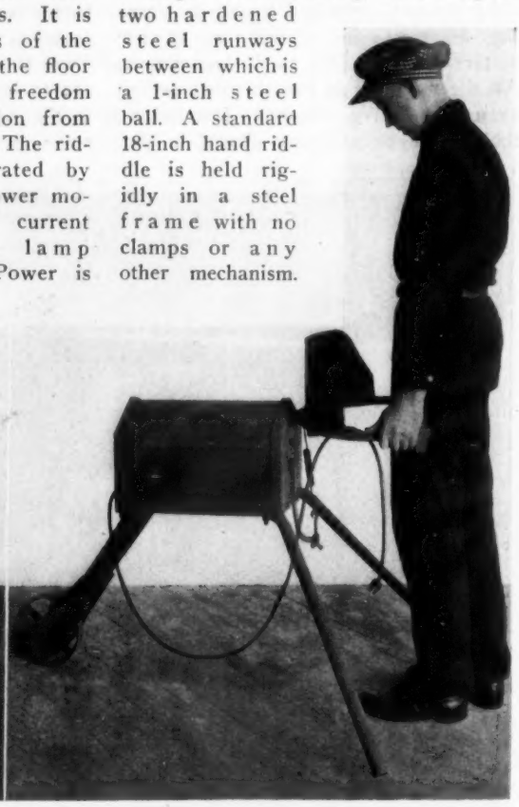


FIG. 2—PORTABLE RIDDLE SHOWING METHOD OF MOVING IT ABOUT LIKE A WHEELBARROW

Heat-Treating Steel Automatically

Description of Electric Furnaces Designed to Eliminate the Human Factor in Thermal Processes

BY THADDEUS F. BAILY

SINCE steel was first used, its heat-treatment for the purpose of increasing the physical properties, has been carried on in connection with materials for war purposes. Until the advent of motor-car production in commercial quantities, however, heat-treatment of steel in commercial work was little practised excepting in the treatment of tools.

The strains developed in motor-car operation, however, demanded material of greater strength and resilience than that offered by common steels, and new alloy steels showing remarkable physical properties were rapidly produced in commercial quantities. It soon developed that even these new steels must be heat-treated in a proper way as determined by their composition, in order to give reliable results in service. At this time, therefore, heat-treatment of steels in large quantities became acknowledged as an essential operation in the manufacture of all steel parts subject to severe strain. Thus the advantages of heat-treatment were known from the earliest time, but this knowledge was not put into extensive commercial practice until the success of a great industry depended upon its application.

Problem of Heat Treatment

The problem that immediately confronted the users of heat-treated steel was the lack of uniformity shown in its physical properties. For any given steel, this was immediately traced to the imperfections of the means employed, as heat-treatment at first was done in some crude form of combustion furnace, either oil, gas or coal fired. Coupled with the imperfections of the heat-treating furnace itself, was the inadequate means for quenching the material after heating for the purpose of hardening. It soon became known that for a given steel, the quenching temperature, time in the quench, quenching liquid and its temperature, were all factors of importance affecting the physical properties of the steel under treatment. Another, and one of the most uncontrollable variables, was the human element, to which all the other variables were more or less inseparably connected. The problem in heat-treatment, then, becomes one where if results possible of attainment with any particular steel are to be realized and engineering calculations based on these figures, the treatment must be carried on with such equipment and by such methods that the chance of any variation in the essential features of the treatment, must be reduced so as to preclude the possibility of the material passing through the heat-treating equipment without receiving the treatment intended.

Automatic Control of Heat

When heating with electricity, the temperature of the furnace can be maintained within a few degrees of the designated temperature whether standing idle or running at any predetermined capacity. The human element involved in the operations of drawing the charge when heated, quenching and recharging, is still to be considered. In response to a demand for heat-treating equipment of the automatic type, where the human element would consist solely in placing the material on the charging platform of the first furnace, the equipment described in this paper was developed. One installation of this equipment has operated continuously over periods of more than 3,000 hours, in which time more than 8,000 tons of steel were treated with a temperature variation in the metal of less than 10 degrees Fahr.

A typical equipment embracing all the features required to perform automatically the essential operations in heat-treating, consists of an electric furnace of the continuous type, in which the material under treatment is moved through the furnace on cast beams of suitable shape and composition, by means of hydraulic pushers and a hydraulically operated transfer and quenching device adapted to reach into the furnace immediately after opening the doors.

A charge of heated material is pushed on to the transfer platform by the pusher at the opposite end of the furnace. When this material has reached a central position on the transfer platform it is withdrawn from the furnace and plunged into the quenching bath. The downward movement of the transfer opens the valve on the quenching medium supply line, which supply is maintained under a constant head and temperature. The transfer platform with its material remains in the quench, and the cold quenching medium is allowed to flow unrestricted until a time element device actuates the hydraulic valve on the lift cylinder of the transfer, whereupon the transfer platform with the material is raised out of the quench and placed on the charging platform of the second or drawing furnace. Here it remains at rest until moved into the second furnace by the pusher on that furnace. Simultaneously with the movement of the material into the second furnace, the heated material is pushed out of the discharge end.

The important element in the operation of the entire equipment is the temperature measuring devices adapted to take the temperature of the material under treatment itself, not the furnace temperature. When the material has reached the designated temperature, these special pyrometers actuate the interlocked electrically operated hydraulic valves on the valve pulpit controlling the cylinders performing the various motions of the equipment.

Cannot Operate Prematurely

The material cannot be removed from the first furnace until the prescribed temperature has been reached. At this time, it is quickly removed and quenched for a definite period in a liquid of constant temperature, after which it is put into the drawing furnace and subsequently withdrawn upon reaching the designated temperature for the drawing operation. When the material under treatment is delivered at the discharge end of the second furnace it can have had no other treatment than that for which the equipment is adjusted.

The S. Obermayer Co., with factories at Pittsburgh, Chicago and Cincinnati, is sending out a four-page pamphlet on its line of boiler graphite. This graphite is said to be non-corrosive. One quart of graphite for 100 horsepower is used and it is suggested that a mixture consisting of graphite, boiled linseed or carbon oil and a small quantity of litharge will give desired results.

Presented at the fall meeting of the American Iron and Steel Institute, Cleveland, Oct. 22-23. The author, Thaddeus F. Baily, is president, Electric Furnace Co. of America, Alliance, O.

Authors of Papers Read at Institute

BETHUNE G. KLUGH,
Field Manager, American Ore Reclamation Co., New York

THE papers presented at the fall meeting of the American Iron and Steel Institute, Cleveland, Oct. 22-23, were of the same high character that has made previous meetings of this organization notable. While the number of papers presented was somewhat smaller than previously, they aroused considerable interest, as evidenced by the interest taken in the informal discussions.

Photographs of the authors of five of the papers read at this meeting, are shown on this page. Ambrose N. Diehl, who presented the paper on "Modern Methods of Burning Blast Furnace Gas in Stoves and Boilers", several weeks ago was appointed assistant general superintendent of the Duquesne Steel Works of the Carnegie Steel Co. Previous to that time Mr. Diehl had served for a number of years as superintendent of the Duquesne blast furnaces. His paper evoked much comment.

EDGAR D. ROGERS,
General Sales Manager, United Steel Co., Canton, O.

HENRY M. HOWE,
Emeritus Professor of Metallurgy, Columbia University, New York

"The Development of Alloy Steel for Commercial Purposes" was presented by Edgar D. Rogers, general sales manager of the United Steel Co., Canton, O. George H. Jones, vice president of the Inland Steel Co., Indiana Harbor, Ind., was the author of the paper on "Under-Advertising of the Steel Business". Bethune G. Klugh, field manager of the American Ore Reclamation Co., New York, presented a paper on "Recent Mechanical Developments in Sintering Iron Bearing Materials". Henry M. Howe, emeritus professor of metallurgy, Columbia University, New York, presented a paper on "Casting Steel Ingots". Thaddeus F. Baily, president of the Electric Furnace Co. of America, Alliance, O., described the "Electric Furnace for Heating Billets, Castings, etc".

GEORGE H. JONES,
Vice President, Inland Steel Co., Indiana Harbor, Ind.

AMBROSE N. DIEHL,
Assistant Superintendent, Duquesne Steel Works, Carnegie Steel Co.

Mechanical Progress of Sintering

A Discussion of the Developments in Sintering Iron Bearing Materials —Reclaiming Low Grade Ores

BY BETHUNE G. KLUGH

IN CONSIDERING the problem of sintering, it was early demonstrated that certain essential features of operation must be determined and maintained constantly under control, in order to produce maximum quality and quantity of sintered product.

The purpose of this paper is to describe the mechanical improvements that have contributed to the progress made in sintering iron bearing materials by the Dwight and Lloyd continuous process.

The requirements given in the box on page 838, are those which apply to the sintering operation itself, and each one is attained through mechanical means. In addition to these operations, it is obviously essential that all the work of handling material and product to and from the plant be done efficiently and economically, in order that the operation be commercial.

Types of Sintering Plants

Two types of general arrangement of sintering plants have been developed:

(1.) That with storage bins placed on the ground, in which the proportioning of the sintering mixture is effected and the mixture then elevated.

(2.) That with storage bins elevated so that only one elevating operation is required, and all handling after proportioning is accomplished by gravity.

While all elevating and conveying machinery is an item of expense as to maintenance, a certain amount is necessary in order that all the functions be most efficiently performed. Bucket elevators, inclined belt conveyors, grab buckets and skip hoists are all applicable to sintering plant operation, depending upon local plant standards and conditions. The types adopted should, of course, be selected by these considerations in the order named:

(1.) Efficient operation.
(2.) Low maintenance and operating costs
(3.) Low installation cost.

The materials treated include flue dust, magnetic concentrates, pyrites cinders, high sulphur magnetites, hematites, and also plastic and hydrated ores. Regardless of what material it is purposed to treat at any particular works, it is not probable that this material will be treated exclusively throughout the life of the sintering plant. Therefore, it is necessary that the handling equipment installed be applicable to as wide a range of materials as it is possible to make it.

One plant that was installed for the exclusive treatment of flue dust has in three years of its existence sintered and desulphurized, on a commercial scale, flue dust, magnetic concentrates, pyrites cinders and hydrated hematite ores.

Screening the Materials

At the present time flue dust is the material which has the greatest sintering interest. Flue dust should be screened prior to sintering. The large sizes of coke, that is, sizes larger than ½-inch, have no value as a sintering fuel, but have a value for other purposes when screened free from flue dust. All of the various types of screens on the market have been used for screening flue dust. The usual types of revolving and reciprocating screens have been somewhat disappointing. Perfectly dry flue dust as taken from the dust catcher can be effectively separated on almost any type of screen. However, it is essential to provide for the screening of stockpile flue dust, which is delivered to the sintering plant in a moist condition, usually with 5 to 18 per cent moisture.

The American Ore Reclamation Co. has developed a screen upon a somewhat novel principle, which screens flue

Presented at the Cleveland meeting of the American Iron and Steel Institute, Oct. 22. The author, Bethune G. Klugh, is metallurgical engineer, American Ore Reclamation Co., New York.

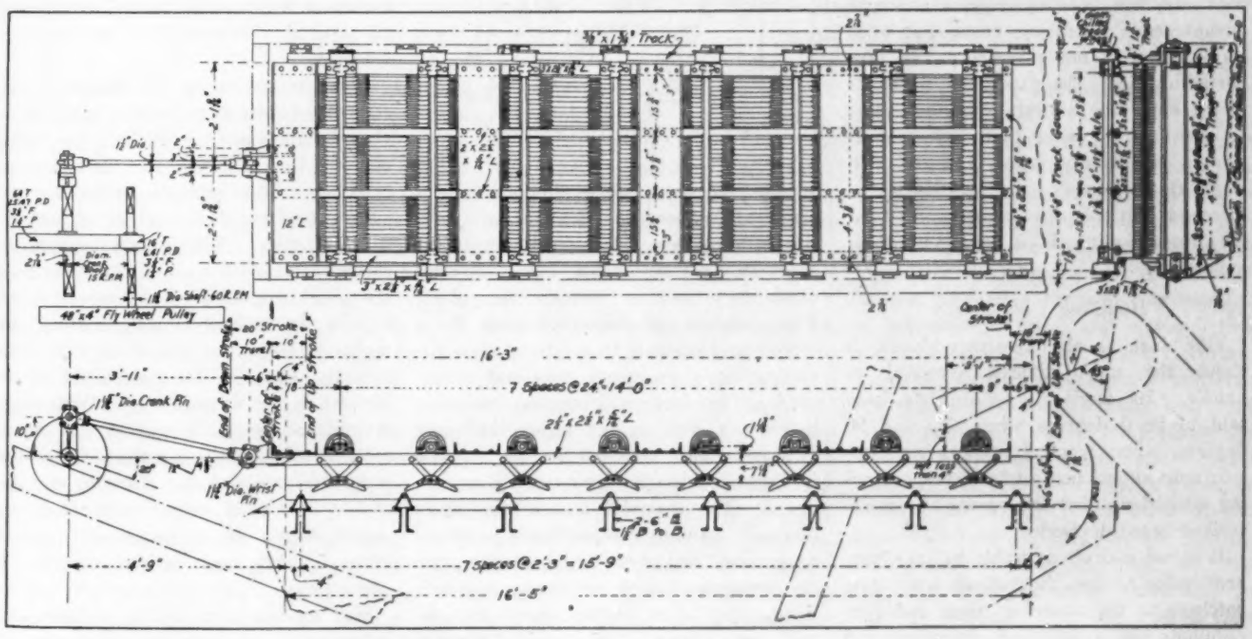


FIG. 1—SELF-FEEDING AND SELF-CLEANING FLUE DUST SCREEN

dust of the above character and delivers over-size coke sufficiently clean for use as a blast furnace fuel, and other purposes, according to size.

The special characteristics of the screen are its self-feeding and self-cleaning features. A modification of this screen has been installed at the Central furnace of the American Steel & Wire Co. at Cleveland. Its arrangement, which was developed by the mechanical department of the above works, is very ingenious, in that the flue dust is delivered to the screen directly as taken from the stockpile by the grab bucket. The advantages of this particular arrangement are purely local, and in a new plant such a screen should be an integral part of the sintering plant, and should handle all materials.

Fig. 1 shows the reciprocating type. The principle both of this type and of the screen equipment at the Central furnaces is the same. In the type shown in Fig. 1, the cleaning fingers are reciprocating between stationary screen bars. The Central furnace type reciprocates the bars between the stationary fingers. Its performance is very satisfactory.

This type of screen is recommended for flue dust, but it is applicable to other materials requiring sintering. However, magnetic concentrates and pyrites cinders usually have been subjected to sufficient screening action in their production. The arrangement of each sintering plant should utilize local conditions to best advantage, but almost universally the material to be sintered should be screened prior to placing in the sintering plant bins.

The screen may operate integrally with the bin loading equipment, with advantageous operating costs, but such arrangement is not essential. The proportioning of the various materials which enter the sintering mixture must be accurate, in order that such proportioning be of any value. If an indeterminate quantity of oversize is screened out of any constituent after the proportioning is done, accuracy is impossible.

Handling Flue Dust

Flue dust, as all experience shows, is about the most difficult material to handle. Its angle of repose has been said to be 0 degrees when dry and 90 degrees when wet. It was after considerable experience, under widely varying conditions, that the screen above described was developed.

It is, of course, desirable to take current make of flue dust direct from dust catchers to the sintering plant and thus eliminate the expense of unloading and eventually reloading at the stockpile. The great disadvantage in such procedure lies in the dust nuisance involved. It is practically impossible to handle a dry flue dust in any plant without filling the atmosphere of the plant with dust, with its incident detriment to all operators and to the machinery. It is practically impossible to effectively moisten hot and dry flue dust by the usual means of a hose. A puddle of water may be placed on top of a car of hot flue dust and the material remain hot a foot below. The dumping together of wet and of hot flue dust has often caused disastrous effects due to precipitating hot dust upon workmen.

The problem has been very satisfactorily solved by the following procedure:

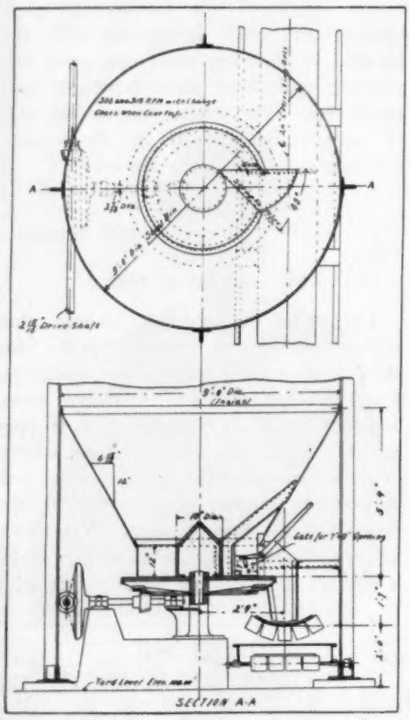


FIG. 2—FEEDING DEVICE

The car of dry dust is dumped into a receiving hopper; the dust thrown into the atmosphere from this dumping operation is considerable, but it is only momentary and is outside the plant. The material is then delivered to a screen and passed from the screen directly into a short pug mill and moistened. The feeders from the receiving hopper as well as the screen and pug mill are wholly enclosed so that no dust is thrown into the surrounding atmosphere. The material leaving the short pug mill contains just sufficient moisture to prevent any dust being thrown into the atmosphere, and yet giving it a free flow angle. The description of this detail may appear of a kindergarten nature, but the small operation described has satisfactorily solved the dust problem in some sintering plants.

In order that two or more finely divided solid materials be accurately and continuously proportioned, a feeding device of simple, accurate and dependable characteristics should be provided. After trying a number of types and various modifications of these types, a modified form of the revolving disc feeder has proven satisfactory. The form finally adopted is shown in Fig. 2. This feeder has the following desirable characteristics for this service:

(1.) Positive volumetric discharge from the bin
(2.) By its motion it tends to make the bin discharge uniformly on all sides
(3) It is subject to adjustment in two ways: By altering (a) the height of the discharge gate and (b) the speed of the disc.
(4.) Mechanically simple, requiring only one bearing for support
(5.) Subject to multiple control, as any number of feeders may be geared together in positive operating unison
(6.) Very slow moving, which is conducive to lowest cost of mechanical maintenance.

Mixing Devices

For accurate mixing of the proportioned materials several devices are on the market. We have, however, developed a pug mill which handles and mixes any materials satisfactorily, whether plastic or granular. All gears and bearings are made practically dust-tight; the wearing portions of the blades are changeable; with very slight expense and loss of time the shaft carrying the blades may be removed bodily without disturbing the bearings, and the bottom may be dropped for cleaning, while running. Thus for moderate expense a mixer embodying all desired characteristics can be provided.

It is the custom in the design of our sintering plants for the pug mill to be placed immediately preceding the delivery of the material to the sintering machine. This permits immediate adjustment of moisture content of the sintering mixture. This is a most important factor in operation as a slight change in the physical quality of the material will require immediate adjustment of the moisture content of the mixture in order that the sintering be maintained at the highest degree of efficiency. With slight training an operator may note, immediately after the ignition, a change in moisture requirement of the sintering mixture and by means of valves on the pug mill water supply effect the proper adjustment of this item in five minutes of operation.

For making a perfectly uniform distribution of the mixture over the entire hearth area, we have tried out in

actual practice a number of devices, too numerous to mention and not of present interest. The simple and effective swinging spout has solved the problem very satisfactorily; as the line of pallets move in a continuous straight line, the swinging spout moving across this line of pallets, maintains the uniform deposition of the sintering mixture. In this way, changing the direction of the entire stream continuously, gives uniform structure to the entire bed.

When treating a highly variable material such as flue dust, it is necessary to change the depth of this layer from time to time, as changes in the characteristics of the flue dust demand. There is always some critical thickness of charge for any specific material at which the greatest quantity and the best quality of sinter is produced. The system of bins and proportioning feeders, mentioned previously, will readily strike the best average of the sintering mixture, when the material is fairly uniform, and hence the depth of charge can be held constant; but when flue dust is the material treated, it will be found to vary from day to day in fineness, so that the thickness of layer at which the best sintering is performed will vary 50 to 100 per cent. Operators should watch carefully such changes and make necessary adjustments for them.

The super-hopper, which is above the pug mill, is in no sense an auxiliary storage, but is simply a feeder, the function of which is to hold enough material to maintain the sintering layer at a given depth. In order to prevent undue surcharge in this hopper, which interferes with the regularity of feed, it is very essential that the quantity of material delivered to the sintering machine be exactly its capacity, under existing conditions. The feeder or group of feeders which delivers this sintering mixture must synchronize with the speed of the pallets. Obviously the solution of this requirement is to gear the feeders and the sintering machine together. The absence of any transmission elements conducive to slippage is desirable, because the synchronism must be positive in order to be of value. This arrangement is used where the sintering mixture is delivered to a super-hopper after being proportioned, and where the moisture requirements of the mixture must be changed to conform to changes in the raw material. Flue dust is one material especially referred to in the latter statement.

Where the material to be sintered is of a homogeneous nature, such as ores or concentrates, the pugging may be done immediately following the proportioning feeders. In this case the super-hopper should be mounted directly above the sintering machine feeder, and the feeder is driven directly from the sintering machine gearing. This gives a very desirable arrangement in that the feeders are always in sight of the operator.

A plant is now being constructed by the C. O. Bartlett & Snow Co., Cleveland, in which elevated storage bins are located within the building structure and are filled by means of an automatic skip hoist. In this plant the feeders for proportioning the sintering mixture discharge directly into the pug mills; hence, they combine the functions of proportioning feeders and super-hopper feeders. It is necessary that these feeders maintain the desired proportions accurately, and at the same time be subject to positive synchronism with the hearth speed of the sintering machine. This is accomplished by using an adjustable speed motor which drives an adjustable speed counter-shaft. The sintering machine is driven directly from the usual constant speed pulley, and the feeders, in unison, driven from the adjustable speed counter-shaft. The result of such arrangement is that when the various feeder gates are set to give a definite mixture, these proportions are maintained accurately, while the volume is varied at will by decreasing or increasing the speed of the feeders as set. It is noted that this set of feeders are driven by a compact and simple set of gears, and any one or more of the feeders may be stopped at will by means of individual clutches. The feeders will all synchronize with the speed of the pallets, while when desired they may have their speeds changed independently of the sintering machine.

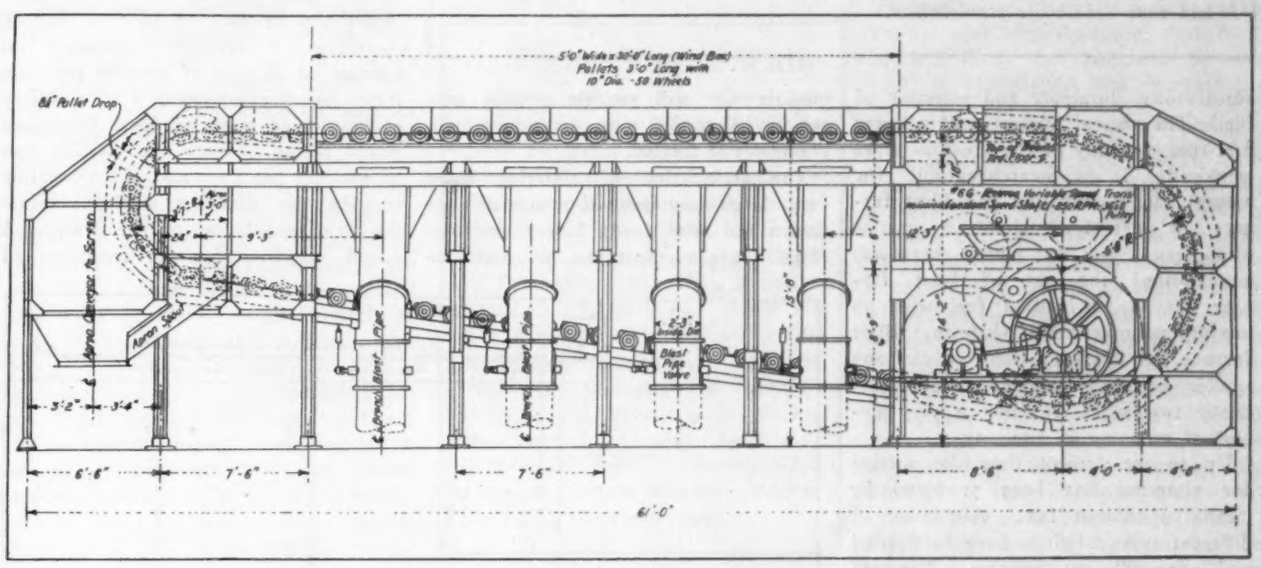


FIG. 3—LARGE SIZE DWIGHT & LLOYD SINTERING MACHINE

The next function performed upon the sintering mixture is the ignition. This ignition must be of ample intensity to positively ignite the entire surface of the charge and yet not so intense that it will dry out the charge. In the later case the sintering mixture is prematurely dried and the sintering action retarded, with incident curtailment of output. Occasionally materials are encountered which require only very light ignition in order to produce the greatest sintering speed, while other mixtures will give best results under an ignition so intense as to leave an incipiently fused surface on the charge. No phase of this sintering art has passed through so many vicissitudes as that of ignition. Starting with a light gasoline torch, on our initial plant, we have passed through many types of

burners employing fuel, oil, kerosene, bituminous coal, coal gas, natural gas and blast furnace gas.

Fig. 4 shows the ignition burner now in use, which fulfills all requirements for effective ignition, including adjustability, durability and economy of fuel. The present burner is of a lower first cost than any of the previous types employed. It is interchangeable for natural gas, illuminating gas, blast furnace gas or fuel oil, simply by change of mixers. With this burner there was accomplished the use of blast furnace gas as an ignition fuel with no mixture of other fuel whatever. Blast furnace gas has been used without any trouble or delay whatever for practically two years, effecting a very important economy in sintering.

Up to the present time the suction for sintering has been produced by means of exhaust fans. A number of different types of fans have been tried and are still in operation. Fan engineering being a branch in itself, involving the control of many variables, there will be no resume here of the vast amount of technical data collected relative to this work. Fans of larger diameter with low speeds have given better results than smaller fans at high speeds. The type of fan now giving satisfaction is about 100 inches in wheel diameter, running at 600 to 720 revolutions per minute and is capable of handling about 20,000 cubic feet of gases per minute. The continuous nature of the Dwight & Lloyd process maintains a constant load on the fan, which is advantageous to the use of fans of large capacity.

Sizes of Sintering Machines

The Dwight & Lloyd sintering machine is made in three sizes, to meet the varying requirements:

1.—Small size.....42 inches × 13 feet.
2.—Intermediate size ..42 inches × 25 feet.
3.—Large size.....60 inches × 30 feet.

The small size can be converted into the intermediate size by simply lengthening it, if it becomes necessary to make a larger output. This small size is designed for plants where the available material for sintering is from 50 to 100 tons per 24 hours. The intermediate size will provide a daily output of 100 to 250 tons, depending upon the material treated.

The anticipation of sintering some very large tonnages of materials has shown the need for a larger size machine. A convenient and practical size is shown in Fig. 3. This machine has a hearth area 70 per cent greater than the intermediate size and has a daily capacity of 300 to 400 tons per machine, according to the material treated. The design of this machine is more simple and much stronger in its parts than the machines previously built. These three sizes provide equipment for any capacity of sintering operation desired.

Increasing Output by Auxiliary Apparatus

The results of the careful study of all the details involved are shown in the fact that the original product per square foot of hearth area has been in some cases trebled. A sintering plant built for operation upon pyrites cinder had a capacity, based upon work done at the initial plant, of 75 tons per day per machine, but has now reached a production of over 200 tons per day per machine. Another plant constructed for a capacity of 75 tons per day per machine from flue dust, is making an average of 170 tons per day per machine. The first machine installed was of the same size as all of the machines now in use. In its first year of operation it scarcely exceeded an average of 50 tons of product per day. After being re-equipped with auxiliary apparatus, as good as local conditions would permit, it now exceeds 150 tons of product per day, and is successfully treating ore carrying sulphur. Since the first installation of the Dwight & Lloyd machines for the treatment of iron bearing materials, four years ago, and without changing the size of the machine, its daily capacity has been increased over 200 per cent and its ultimate capacity has not been reached.

(*Continued on page* 868c.)

Requirements for Successful Sintering

The requirements for producing the maximum quality and quantity of the sintered product are:

(1.) Maintenance of accurate and uniform proportioning of the various materials which make up the sintering mixture;

(2.) Maintenance of homogeneous mixing of these materials;

(3.) Accurate proportioning and mixing of the water required to be added for producing the ideal moisture content for a sintering mixture;

(4.) Delivery of the sintering mixture to the sintering device so as to permit the most permeable and homogeneous bed over the entire hearth area, and a readily adjustable depth of charge to that which proves most efficient for the specific material treated;

(5.) Ignition of the surface of the sintering charge with proper and uniform intensity over the entire surface;

(6.) Exhausting the waste gases so as to conduct through the interstices of the charge the largest volume of air that can be usefully applied, but so as to avoid an excessive pressure which would compact the charge and thus reduce its permeability.

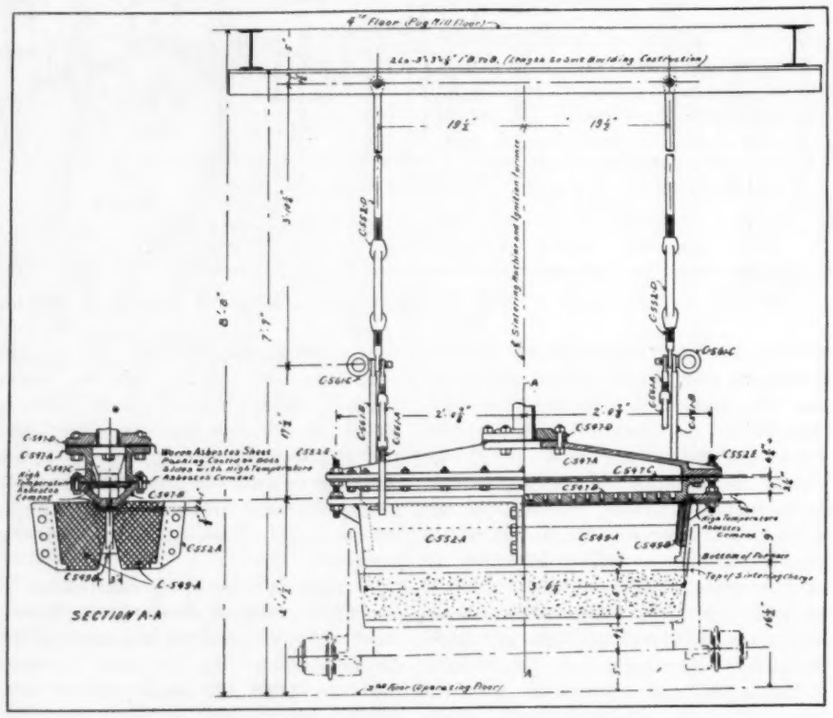


FIG. 4—BLAST FURNACE GAS BURNER

Alloy Steels in Modern Industries

Though of Prehistoric Origin, the Commercial Development of Ferro-Alloys Did Not Begin Until the Last Century

BY EDGAR D. ROGERS

THE oldest known alloy steels are an ingot of prehistoric times, analyzing 1.20 per cent carbon and 1.60 per cent silicon, unearthed near Nancy, France, and a tool containing a small percentage of nickel, removed in 1837 from the Cheops pyramid. The Damascus steel of Toledo, Spain, contained tungsten, nickel and manganese. There is no evidence that these steels were intentionally alloyed; they were the result, probably, of a combination of different element bearing ores. The effects of phosphorus, sulphur, bismuth, tin, antimony and arsenic in iron were known about 1740. It was not, however, until the first half of the nineteenth century, and then only after ordinary carbon steel composition had been determined by Reaumur, that the first intentional experiments to alloy metals with iron were undertaken. In 1812 Hassenfratz, under orders from Napoleon, completed his work on the effects of cobalt in iron. The effects of titanium, chromium and tungsten were also made known about this time. In 1819 Faraday and Stodard attempted to produce experimentally some synthetic alloys, their object being to obtain metals which would be more resistant to oxidation than common steels. Berthier in 1821 discovered the excellent properties of chromium steel. Further experiments in 1829 by Berzelium developed an alloy of peculiar properties called meteor steel, which contained zinc, nickel, tin and chromium.

Begin Physical Tests

About 1829 the first determinations of physical properties, such as tensile strength, were made. Experiments revealing the effect of forging on the different steels also brought to the attention of the trade the importance of the homogeneity of steel. The invention of the bessemer converter, in 1856, may be considered the beginning of the present steel age. This also reacted on the makers of the higher grades of steel, and they in turn strove to improve their product, and succeeded in melting the first commercial alloy steels. The first of these, no doubt, was the tungsten steel of Mushet, which, owing to its peculiar properties, was named "self-hardening steel". Mushet also experimented with titanium. His expectations, however, were not fulfilled, and he turned his attention to the use of the elements chromium and manganese in conjunction with tungsten.

Knowledge of silicon and manganese as alloys was limited, up to 1880, although Gautier, in 1876, had made observations regarding the hardening properties of manganese. R. H. Hadfield, in the year 1880, began probably the first thorough research into the properties of silicon and manganese. Hadfield designates the year 1888 as the beginning of a thorough knowledge of alloy steels, when quite a number of such steels were produced in large tonnages and the use of silicon and manganese for the improvement of the physical and magnetic qualities was made practical. The founder of the chromium steel industry in America was Julius Baur, who, after receiving letters patent for the manufacture of chrome steel, formed a company in 1869, which soon marketed its product with success.

In Europe chrome steels were first produced at Unieux, France. In 1870 chrome steel armor piercing shells, as well as armor plate containing about 2 per cent chromium, were for the first time manufactured. From 1822, when Stodard and Faraday at Sheffield first published their experiments on the alloying of nickel and iron, up to 1885, when a pure ferro-nickel was brought out, nickel steel, on account of its expense, was not developed to any great extent. The advantages of this alloy in ordnance led rapidly to its use in the manufacture of heavy caliber guns. It is now employed extensively in automobile construction, for parts such as frames, gears and shafts; and its utility in structural fabrication, engine and ship building, and many kindred lines, too numerous to mention, is established and increasing.

Development of Vanadium

In 1803 Del Rio, professor of mineralogy in the city of Mexico, isolated vanadium, calling it eurythronium. It was not until 1830, however, that Sefstrom, a Swedish investigator, succeeded in attributing the superior properties of some of the soft Swedish irons to this wonderful element, and gave it its present name. The manner of the use of vanadium and its effect became known in 1900 through Arnold, who demonstrated a method of using it commercially. Owing to its enormous early cost, very little was done with it as a steel alloy until in 1905 a vast deposit was unearthed in South America, which brought its cost within reach of the commercial consumer. Vanadium's power as a scavenger, in cleansing steel of impurities other than phosphorus and sulphur, and its dynamic qualities, together with the superior static results obtained by its use in conjunction with chrome, created a demand for this alloy, which has been remarkable. The Swedish irons used as a base for high grade crucible steels owe their virtues to this element. One of its first extensive synthetic uses was in high speed steels, whose cutting properties were trebled and even quadrupled thereby. The demand of automobile, locomotive and high speed engine manufacturers for anti-fatigue material opened a wide field for this product. It was this demand alone that caused the entry of open hearth and electric furnaces into the manufacture of this alloy steel. Chrome vanadium steel was first successfully

A Theme Worth While

Fiction writers who rack their brains for themes which shall yield color and prove fertile of "thrills," could find many an inspiration in the iron and steel industry, were they to take the trouble to go beneath the surface. In the history of ferro-alloys alone is a veritable mine of interest. The author of this scholarly and able article on useful alloys, which it was unavoidably necessary to abridge, through lack of space, is general sales manager, United Steel Co., Canton, O., formerly having filled a similar position with the Cambria Steel Co., Cleveland district.

From a paper read at the ninth general meeting of the American Iron & Steel Institute, Cleveland, O., Oct. 22 and 23, 1915.

made in the open hearth furnace in commercial quantities in 1907. The consumption of vanadium as an alloy has steadily grown so that today it is used in combination with practically all other alloys, and in crucible, electric and open hearth practice.

During the past decade, wonderful strides have been made in the development of alloy steels of high physical properties. Such developments were brought about largely by the severe and exacting requirements of automobile manufacturers, as with the introduction of motor vehicles it became necessary to economize in space and weight, and to meet these requirements, metallurgists turned their attention to the development of steels of greater efficiency. This resulted in the adoption of practically standard analyses. Another class of alloys was developed by adding abnormal quantities of the essential impurities, silicon, manganese, or both, either with or without the standard alloying elements, in the production of satisfactory manganese, silicon and silico-manganese steels.

Machining of Alloy Steels

Some consumers specify alloy steels which must be made to analysis, heat-treated to certain required physical results, and then either cold drawn or turned and polished.

The problem now confronting the steelmaker is that of the machineability of steels capable of possessing high physical properties. Marvelous development in tool steels, due to the improvement of the present-day high-speed steels, has caused a proportionate increase in the efficiency of machine tools, which means a speeded up production which would have been inconceivable ten years ago. The development of machineable steels has not kept pace, however, with the improvements in tool steels and machine tools. This is not entirely to be blamed upon the steelmaker, as much steel is furnished in a green state, or else the operations performed upon the steel before machining, being thermal in nature, destroy its production efficiency, unless its structure is returned to its proper status.

The question of chemical and physical specifications is an important one to the steelmaker. It has been the habit of consumers, when buying their materials, to specify both chemical and physical properties, and in a good many instances properties that are conflicting and inconsistent. It has been our experience, and no doubt that of all the other makers of steel, to receive orders on which certain commercially possible chemical limits are outlined, together with physical capacities that are absolutely impossible with the prescribed analysis. In some cases the ductility factors of elongation and reduction are specified at percentages which cannot be met with the high elastic limit required. In others, the hardness, placed either at a maximum to obtain machining qualities, or at a minimum to assure the elastic limit being up to specifications, is entirely inconsistent with the tensile strength and elastic limit.

Give Slight Thought to Section

These discrepancies, it may be said, are in a measure due to the steelmakers themselves, owing to the fact that comparatively recently available data on alloy steels was obtained through tests in which the type of steel was the only variable, little consideration being given to section when recommending a steel for a prescribed purpose.

A standard test piece which has been heat-treated after machining, as is well known, will show percentages of elongation and reduction which cannot be obtained with a test piece machined from a heat-treated part of greater section. Again, a treatment which will produce certain properties upon a test piece treated after machining, will not suffice for a heavier section. Because of the inconsistency of imposing physical specifications based on a standard test specimen heat-treated, as against a specimen cut from a larger section after heat-treatment, steel manufacturers have often found difficulty in meeting requirements. Physical specifications should be drawn up in accordance with results obtained from tests taken from the full section in question. Data are often given out by steel manufacturers as to physical properties of steel, without specifying the section from which the tests are made.

Ignore Purpose of Steel

Manufacturers have often been impressed with the virtues of some type of alloy steel, by reason of its exceptionally high physical properties, assuming, for instance, that a steel which shows an elastic limit of 200,000 pounds per square inch must necessarily be better than one which shows only 150,000 pounds, ignoring entirely the purpose for which the steel is to be used. In reality the lower elastic limit steel of greater ductility may, for a particular purpose, serve to better advantage than that of higher elastic limit and lower ductility, both results, however, being obtained from the same steel by different thermal manipulation. The various types of alloy steels have each distinct properties for a constant elastic limit, the latter being the working feature in all parts, because after determining the stresses and adding a factor of safety, one obtains a gross stress which must be resisted, and this resistance must in all cases be exceeded by the elastic limit. The type of steel to be selected should be determined by the nature of the stresses and not by their amount, for it is possible to obtain equal elastic limits in several of the modern alloy steels; for instance, an alternating stress which will cause a chrome nickel steel to fail will not impair a chrome vanadium steel, even though it is treated to show no greater strength. The consumer should, when specifying steel, arrive at the grade through the nature of his stresses, the physical properties by the amount of the same, and be content with the tensile, reduction, hardness, etc., which that particular type of steel must necessarily possess with a certain elastic limit.

American Alloys Increase Prestige

The manufacture of alloy steel tube stock has received great impetus in this country during the war. Many consumers in this country have learned that a high grade product of alloy steels can be obtained from American steelmakers.

The railroads have been far less active in the adoption of alloy steels than the automobile manufacturers, though during the past few years they have recognized the merits of alloy steels in effecting greater safety at high speeds.

The first obstacle in securing a more universal acceptance of alloy steel by the railroads has been the lack of preparedness on their part to properly undertake heat treatment. An alloy steel without heat treatment is but little better than a carbon steel, and in some cases more dangerous. Sound business principles should prompt the user to heat treat, in order to obtain the maximum efficiency, for which the consumer pays the additional cost for alloy above carbon steel. Proper heat treatment will, in many alloy steels, approximately double the static strength, and will at the same time produce a higher degree of ductility. I predict that the next few years will show a greatly increased demand for alloy steels from the manufacturers of railroad equipment, machine tools, engines, mining machinery, farm tractors and aeroplanes. Alloy steels will also occupy a larger field in marine construction, particularly in submarine

(*Continued on page* 868b)

English Continuous Billet Furnace

Exclusion of Outer Air From Combustion Chamber Reduces Radiation Losses—

Semi-Automatic Hydraulic Charging Device is Utilized

A CONTINUOUS, gas-fired furnace for heating steel billets, which has been developed by A. C. Ionides Jr., London, Eng., employs

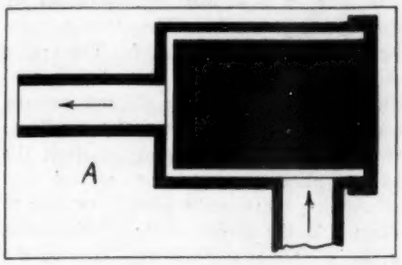


FIG. 1—DEVICE TO PREVENT BACK FIRE FROM BURNER

a self-supporting mixture of gas and air. This method permits the exclusion of outer air from the furnace, reducing the heat losses from radiation. But one connection with free space, an outlet for the waste gases, is required, the furnace chamber being almost entirely surrounded by a jacket of waste gases. The principle of the furnace is illustrated in Fig. 2, which closely represents the present form of furnace used by the inventor for melting brass, the latter being shown in Fig. 6. In Fig. 2, *A* represents the firebrick cylinder, forming the shell, *B* the firebrick crucible, *C* the burner supplying previously mixed air and gas, *D* a tight-fitting firebrick cover, and *E* the base; also *F* represents an outlet for waste gases.

Two difficulties which were overcome in the development of this principle were the tendency of the flame in the burner to strike back to the point at which the air and gas were mixed, and the variation of gas pressure in the mains, which interfered with the correct proportioning of the air and gas mixture in the burner. To obviate the first difficulty, brass gauze was at first tried, but the flame passed this barrier. An effectual means of checking the strike-back was finally devised as shown in Fig. 1, the tube conducting the mixture to the furnace being abruptly expanded into an annular chamber about 1/16-inch wide, the flame in no case being able to negotiate the narrow right angle passage. To secure a constant mixture of air and gas regardless of the pressure in the mains, the device shown in Fig. 4 was designed, consisting of an outer air chamber surrounding a bell chamber *A* for gas, which is sealed with liquid and suspended from a balance *C*. The balance also operates air and gas valves *D* and *E*. The varying pressures of air and gas raise or depress the bell *A*, which through the balance *C* opens or closes *D* and *E* until the mixture is again satisfactorily adjusted. This apparatus does not control the amount of mixture but merely its correct proportions. A double needle valve for air and gas is provided at the point of junction.

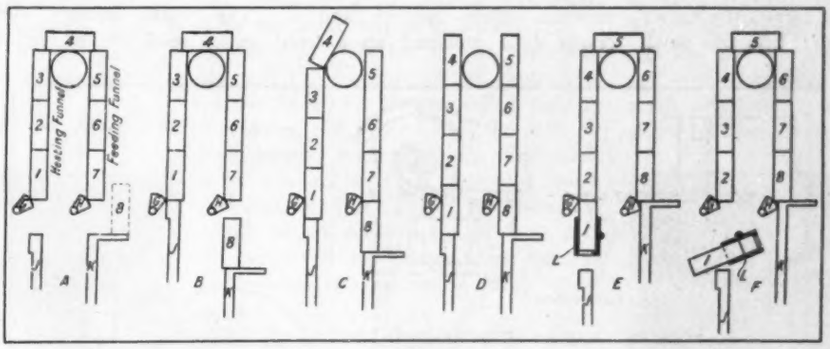


FIG. 3—METHOD OF OPERATING BILLET FURNACE

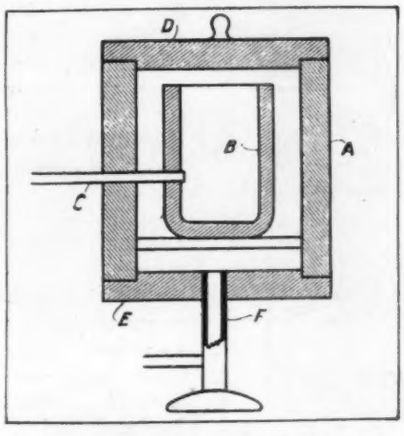


FIG. 2—SECTION OF IONIDES BRASS FURNACE

The brass furnace constructed by Mr. Ionides, shown in Figs. 2 and 6, is said to melt 20 pounds of 70/30 brass in 25 minutes, using 2.65 cubic feet of gas per pound of metal from a cold start and 1.8 cubic feet of gas per pound of metal from a hot start. To heat steel ingots 16 inches long and 6½ inches in diameter continuously for the manufacture of munitions, Mr.

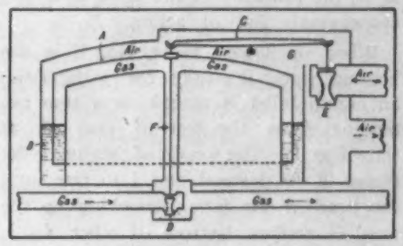


FIG. 4—BALANCE FOR GAS AND AIR MIXTURE

Ionides has arranged a cylindrical furnace 36 feet high designed on the same principle as his brass furnace, with series of gas and air burners at intervals from bottom to top, maintaining a uniform temperature of about 1,000 degrees Cent. The ingots are fed into an auxiliary stack and are automatically raised in a column, passing over a bridge into the top of the furnace cylinder; they pass slowly through the furnace and are withdrawn one at a time, at the bottom, at the rate of one per minute. The furnace is shown in Fig. 7. The method of feed and discharge is dia-

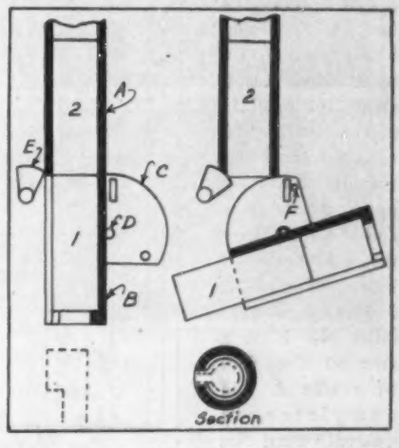


FIG. 5—EJECTING CRADLE OF BILLET FURNACE

grammed in Fig 3. At *A*, Fig. 3, billets Nos. 1, 2 and 3 are seen in the heating stack or furnace, a fourth is lying horizontally on the conveyor drum connecting the two stacks, while billets Nos. 5, 6 and 7 are in the feeding stack. The two columns of billets are supported on the feeding ratchet pawls *G* and *H*. Beneath each column of billets is a hydraulic ram, *J* and *K*, operating in a U-shaped cylinder so that as one rises the other falls. As shown at *A*, the rams are at the same level and consequently out of action.

When the lowest billet, No. 1, in the heating stack is ready for withdrawal, an eighth billet is placed on a step extending from the top of ram *K*, as shown at *B*. The weight of this new billet causes *K* to descend and *J* to rise until the head of the latter, knocking up the pawl *G*, strikes the foot of billet No. 1. As soon as *K* has descended far enough, billet No. 8 is pushed centrally over the ram. In this position the weight of three billets, Nos. 1, 2 and 3, is acting on the ram *J*, while there is but one on ram *K*, causing the former column to descend. This causes billet No. 4 at the top to topple over into the heating column as shown at *C*, Fig. 5. The ram *K*, rising, carries the eighth billet up against pawl *H*, lifts this pawl, and brings billet No. 8 against billet No. 7. The two columns now being equal and in the same position, it is necessary to apply external force by means of a hand gear to continue the operation. This gear is provided with a ratchet, to hold the rams in any desired position. The ram *K* being raised, billets Nos. 8, 7, 6 and 5 are pushed up until billet No. 8 clears the pawl *H* and billet No. 5 falls over horizontally on the upper drum. Ram *J*, descending with the column of billets, Nos. 1, 2, 3 and 4, lowers billet No. 1 on a ring at the foot of cradle *L* and completes its descent until its top is clear of the cradle. As

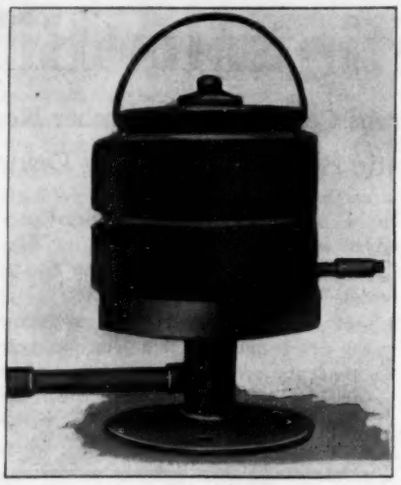


FIG. 6—BRASS MELTING FURNACE

shown at *E*, Fig. 3, the ratchet arrangement serves to hold the rams against their tendency to regain the same level. It will be noticed that the ring at the foot of the cradle is at such a height that when the foot of billet No. 1 is resting on it, the top of billet No. 4 is level with the top of the drum and the edge of pawl *G* is directly in line with the plane of contact between billets Nos. 1 and 2. The cradle *L* is mounted on a fixed axis. Drawing *F* shows it turned to eject ingot No. 1, while pawl *G* slips down to support the rest of the ingots in the furnace stack. The cradle then returns to a vertical position and the ratchet is released to allow the rams to regain the same level. The system has now returned to the position shown at *A*, Fig. 3, except that one hot billet has been withdrawn from the heating stack and a fresh billet added to the incoming column.

In Fig. 5 is shown the operation of the ejecting cradle. The foot of the heating stack is shown at *A*. The cradle *B* is an extension of this, being provided with radius plate *C* and pivoted on fixed shaft *D*. When the cradle is turned into the discharging position, the radius plate supports the second and succeeding billets until pawl *E* returns to place. At the proper angle of discharge, a pin, *F*, strikes a fixed stop, causing the billet to debouch from the stack. The pivot *D* now being above the center of gravity of the unloaded cradle, the latter returns to a vertical position.

The billets are dropped 3 feet to free them from scale. The furnace is supported at intervals of five feet. The first 5-foot section at the bottom has eight burners, the number decreasing until at the top section there are no burners, the incoming billet receiving its first heat from the waste gases, which are carried off through an annular flue.

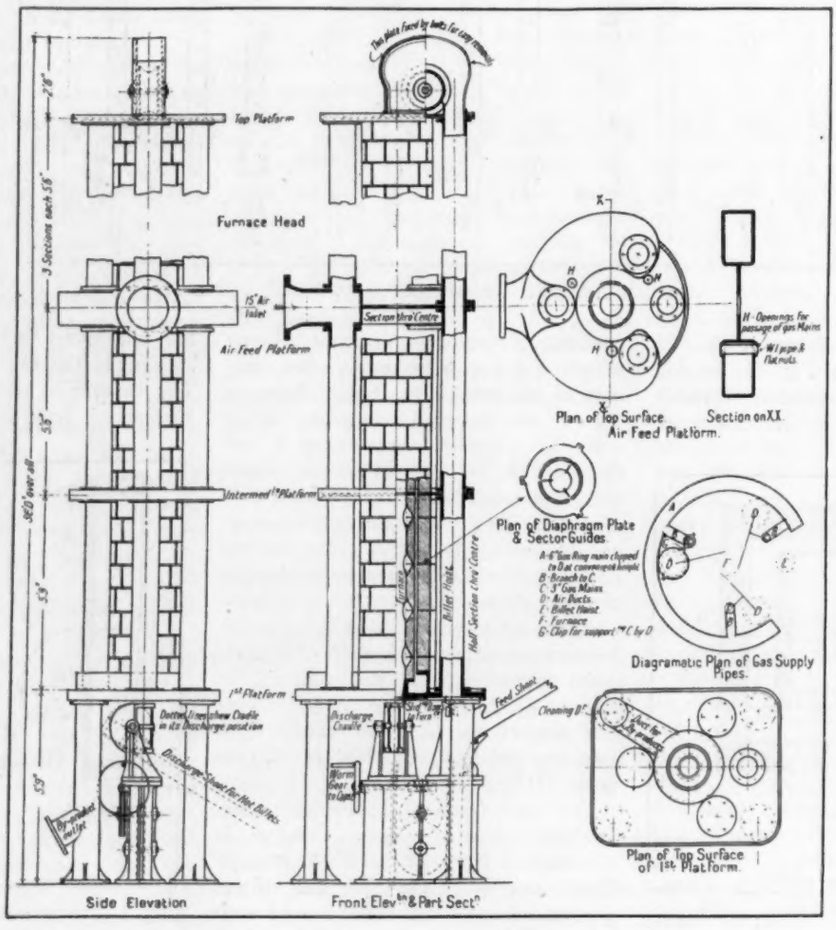

Top Platform
Furnace Head
Air Feed Platform
Intermed.te Platform
1st Platform
Side Elevation
Front Elev.n & Part Sect.n
Plan of Top Surface Air Feed Platform.
Section on XX
Plan of Diaphragm Plate & Sector Guides.
Diagramatic Plan of Gas Supply Pipes.
Plan of Top Surface of 1st Platform.

FIG. 7—CONSTRUCTIONAL DETAILS OF BILLET FURNACE

The Chicago Pneumatic Tool Co., Chicago, is distributing a bulletin, which describes its self-rotating type of hammer drills. These are made in three sizes and are suitable for drilling 6, 8 and 12-foot holes, respectively. Among the features of these drills is that of the rotation of the steel being entirely independent of the hammer piston, eliminating the use of ratchets or pawls. Another feature is the valve, which consists of a standard hardened steel ball traveling ⅛-inch between sockets.

The Detection of Burning in Steel

British Etching Process With Cupric Reagent Discloses a Phosphorus Segregate in the Form of Globules or in Envelopes Surrounding Steel Crystals

BY J. E. STEAD

RESEARCH has indicated that the actual burning of steel, that is, heating it to such a high temperature that the metal is incapable of being rolled or forged without breaking up, is coincident with incipient fusion. Experiments by the writer support this conclusion. In investigations conducted with a steel of high phosphorus content, it has been found that the first liquid to form is extremely rich in phosphorus.

Burnt steel can be readily detected when the metal has cooled, for the phosphorized portions are then discovered, either in globular form or in envelopes surrounding the steel crystals. As a rule, burnt steel reveals itself at the forge or rolls and no other test is necessary to prove burning. If, however, a steel ingot that is known to have been heated to the incipient state of fusion, is allowed to cool undisturbed in the furnace, in order that the liquefied portion may solidify, and is then reheated to the proper temperature, it can be rolled without breaking up and the rolled steel will be good. This knowledge, however, is not of great practical value, for the furnaceman cannot always tell whether incipient fusion has commenced and only discovers the fact when the metal breaks up in the mill or forge. It is of the greatest importance, however, to be able to detect with certainty whether steel has been burnt or is simply redshort.

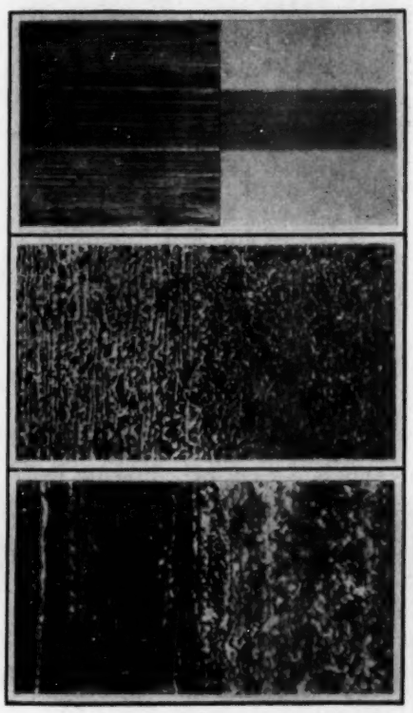
A new method for the detection of burning, employs a cupric reagent which indicates, in all steel which has broken up at the rolls or forge as a result of burning, that the phosphorus has become segregated. Heating to a point just below that of incipient fusion favors the diffusion of phosphorus. If the temperature be so high that a part becomes liquid, this liquid probably corresponds in composition with the last portion to freeze in the solidifying ingot from which the forging was made. This last fluid portion is always high in phosphorus. Whether or not, therefore, the original segregations of phosphorus of the ingot have become rolled out into threads in the forge or in the mill, or have become homogeneously distributed, it is obvious that on reheating to a temperature just above the point at which fusion commences, the first part of the metal to liquefy must contain phosphorus and carbon in large quantities.

To show that penetration of oxygen into the steel has nothing to do with burning, several experiments were made. A plate of high tensile strength was secured, which contained a layer of segregate between layers of purer material, the analyses being as follows:

	Per cent.		Per cent.
Carbon	0.30	Phosphorus ...	0.067
Carbon	0.52	Phosphorus ...	0.134
Carbon	0.30	Phosphorus ...	0.067

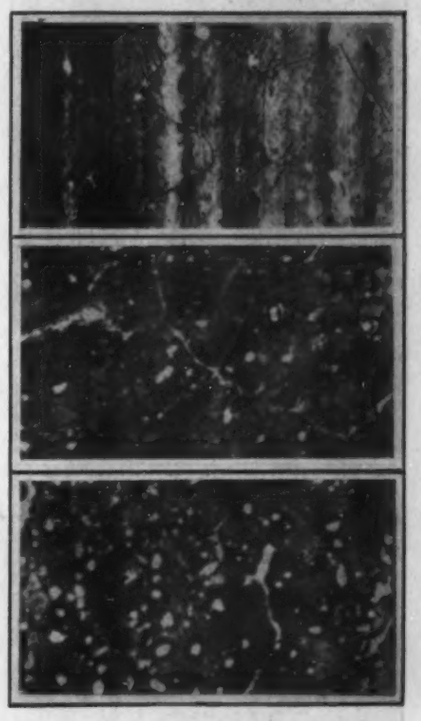
On etching this with the cupric reagent, the phosphorus was found to be concentrated in parallel strata, as shown in Fig. 1 (a). Fig. 1 (b) shows the plate etched by an acid solution. The central portion, necessarily having a lower initial melting point than the steel on each side of it, according to the theory should be burnt before the purer parts outside. Accordingly, the plate was slowly heated up at one end until that part actually melted. It was then taken from the fire and struck with a hand hammer. About two inches broke off suddenly, proving that it actually was burnt. In this plate, metal in all stages from the overheated to the burnt condition, was present. Sections were cut at points at varying distances from the end most highly heated, and these were etched with acid and cupric reagents and then photographed. These sections, which are shown in Figs. 2, 3, 4 and 5, disclosed the fact that exactly what was anticipated had occurred. The globules and envelopes first appeared in the central portion, the crystals being small, while the crystals in the unburnt purer portion were more than twice

From a paper read before the British Iron and Steel Institute.



Figs. 1 to 3

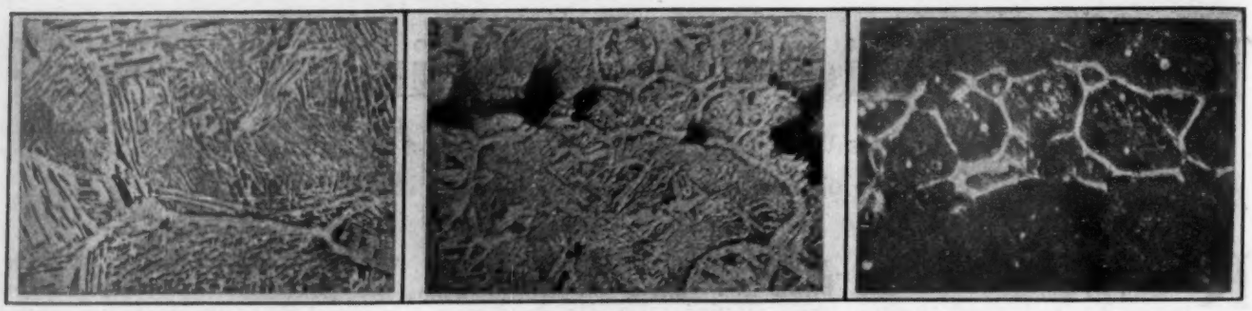
Fig. 4



Figs. 5 to 7

ETCHED SECTIONS OF HIGH TENSILE PLATE SHOWING BURNING

Fig. 1 (a)—Section of plate etched by cupric solution and magnified 2½ diameters. Fig. 1 (b)—Same portion of plate as in Fig. 1 (a), but etched by acid. Fig. 2—Same as Fig. 1 (b) magnified 50 diameters. Fig. 3—Same as Fig. 1(a) magnified 50 diameters. Fig. 4—Plate after heating to a point just above point of incipient fusion but below the temperature of the purer portion, magnified 50 diameters. Fig. 5—Purer portion of Fig. 1, just at melting point, etched by cupric reagent and magnified 50 diameters. Fig. 6—Purer portion of plate, more highly heated than Fig. 5, etched by acid reagent and magnified 50 diameters. Fig. 7—Same as Fig. 6 but etched by cupric reagent and magnified 50 diameters.



SURFACE ETCHINGS OF BURNT SHIP ANGLE SHOWING SEGREGATION
Fig. 8—Unburnt portion of angle. Fig. 12—Part of angle slightly segregated. Fig. 14—Segregated burnt part of angle

FIG. 9—ANGLE SHOWING LIQUATION

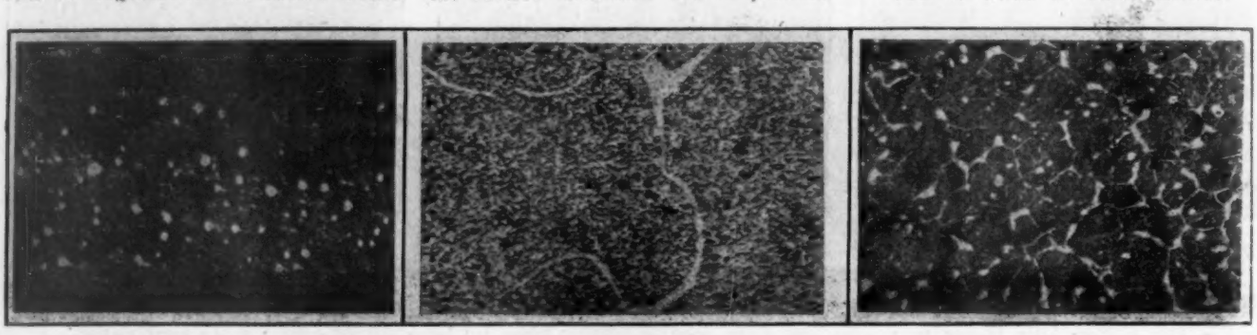
FIG. 10—LIQUATION IN BURNT STEEL

the diameter of the first. The purer steel at the hottest end of the plate had just begun to melt, as is indicated in Fig. 5. Figs 6 and 7 show the same portion, but badly burnt. Fig. 6 was etched with acid reagents, and Fig. 7 by a cupric solution. Figs. 8 to 16, inclusive, show a ship angle which had been sent with the request for an opinion as to whether it had been burnt. The photographs show what a valuable aid the cupric reagent renders to the metallographist. At one time it was believed that oxidizing gases in the furnace entered the steel and oxidized the junctions of the crystals, and that it was this oxide which made the material break up when being forged; but more exhaustive research has shown that the oxide found between the crystals is formed after the material has broken up, when air readily enters the open fissures. If, however, the surface layers have become liquid, the steel boils or froths, some oxide from the surface being mechanically trapped.

The question is often asked of the expert, when steel samples have broken up at the rolls, whether the material is naturally redshort or has been burnt. The sides of cracks found in the steel, whether simply redshort or burnt, are always lined with oxide; and the expert, in conducting his examination, must be careful to select portions free from cracks and to polish and etch them. If they are free from globular specks rich in phosphorus, it may be concluded that the material has not been burnt and is naturally redshort, but if such specks are present, the reverse conclusion will be justified.

FIG. 15—FERRITE IN BURNT ANGLE

FIG. 16—RICH IN PHOSPHORUS



ETCHINGS REVEAL MARKED SEGREGATION OF PHOSPHORUS IN BURNT STEEL
Fig. 11—Segregated portion of angle. Fig. 13—Portion of angle reheated and cooled. Fig. 17—Sheffield carbon steel

Mechanical Developments of Sintering

A DISCUSSION BY HERMANN A. BRASSERT

THE paper on sintering presented before the American Iron and Steel Institute by B. G. Klugh shows how many intricate problems may present themselves in the working out of a simple process, and gives a clear idea of the progress which has been made in developing the continuous down-draft sintering machine through carefully working out, step by step, all of the mechanical requirements of the process. Mr. Klugh and his associates are to be congratulated on their success and the state of perfection to which they have brought the Dwight-Lloyd method.

Here, too, "necessity has been the mother of invention". Flue dust is, of all materials, the most difficult to handle, and on account of the low value even of the sintered product, the cost of treatment must be kept at a minimum in order to make the process commercially feasible. A number of processes have demonstrated the possibility of agglomerating such material through sintering and making a product suitable for blast furnace use, and the sintering problem has resolved itself largely into one of cost of installation and operation. This in turn has narrowed the choice, at least for the sintering of flue dust, down to two processes—the down-draft and the rotary kiln. Each has experienced variations in the mode of operation. In the case of the former we have witnessed the development of the continuous and the stationary methods; in the latter, that of the plain kiln with intermittent operation and of the kiln equipped with chain scraper, permitting of continuous operation, as well as the most recent invention known as the Downs tuyere process.

My intimate practical experience has been the chain cleaned rotary kiln. The one at South Works of the Illinois Steel Co. was the first of its kind installed, and has been successfully operated for the past ten years.

Comparing the two processes, the down-draft process has the advantage of minimum cost of fuel and low cost of installation. It uses no outside fuel except that for ignition, and depends on the carbon content of the dust alone for the heat required to accomplish sintering. For that reason it is sensitive to the variations in chemical analysis of the dust, particularly of the carbon content, and hence the importance of correct proportioning and thorough mixing of materials to give a charge of advantageous and regular composition. The necessity of distributing the draft evenly through the entire bed of material calls for a high degree of physical uniformity. Through establishing the proper relations between the thickness of the bed and the fan suction, the rate of sintering has been greatly accelerated. It is through the careful study of these essential details that large outputs of uniform quality are being made at very low conversion cost by the down-draft process.

The rotary kiln, on the other hand, uses more or less external fuel, and it is for that reason that the process is not as sensitive in regard to the varying qualities of the flue dust. The kiln is mechanically the simplest sintering device, and like the Dwight-Lloyd, serves at the same time as conveyor for the material through the process. With the plain kiln, the main difficulty has been the building up of sintered material on the walls. These ring-shaped accumulations have to be removed at intervals, unless the walls are permanently kept clean by means of a scraper chain. This chain is an essential accessory, since it eliminates the shut-downs, even when flue dust only is used, except for relining of the kiln, which at South Chicago has to be done two or three times a year. The largest cost item is the fuel, although we have been able to decrease it to some extent by preheating the combustion air and by localizing the zone of combustion through modification of the burner. The best remedy, however, is apparently the Downs tuyere process, which forces air under pressure through the shifting bed of materials near the end of the kiln, and thereby burns out the carbon thus utilizing its heat in a similar manner as is done in the down-draft process.

In all methods a regular carbon content of from 6 to 8 per cent is of the greatest advantage. In fact, with a high and irregular carbon content no plant has been able to show as low a conversion cost and to make as satisfactory a product as a plant using good dust. It appears quite likely that out of the necessity to regulate the percentage of carbon, rather than of the impossibility to successfully smelt Mesabi ores or roll scale in their raw state, a portion of such materials will in the future be added to the flue dust.

Among the fine materials to be considered for sintering, those naturally have been chosen first which were present at the blast furnace and steel plants, and had to be disposed of. Next will come such fines which are produced as heads or are now wasted in the tailings in the various wet or dry processes of ore beneficiation; and finally the sintering of a portion of the ores themselves must be considered.

As a material of the first class, the sediment from the discharge of our gas washers demands our special attention. This so-called "pond sludge" is of the greatest physical fineness, is sufficiently high in iron, and on account of its uniform composition should lend itself well to admixture with flue dust. That method which can be adapted to handling this sludge in the most economical manner will have an important place in the future development of sintering. It should, however, always be borne in mind that it is not profitable to treat materials which contain such elements as are detrimental to the furnace practice or to the quality of the iron, and cannot be removed in the process of sintering. Many materials are of too low a value to bear the cost of sintering. Neither is it economical to sinter materials which in spite of their fineness can be used without difficulty in their raw state. As long as the standard grades of Mesabi ores can be smelted in their natural condition with such good results in regard to regularity of performance, uniformity of product, and low fuel consumption as is the well established practice of many blast furnace plants today, it is obviously not practicable to sinter them. But an increasing tonnage of low grade ores will be mined from year to year and much of this must be beneficiated by various processes before being shipped to the blast furnaces. A percentage of concentrated fines is produced in this treatment which should not be mixed with the coarser heads, but should be kept separate and put into suitable shape for blast furnace use.

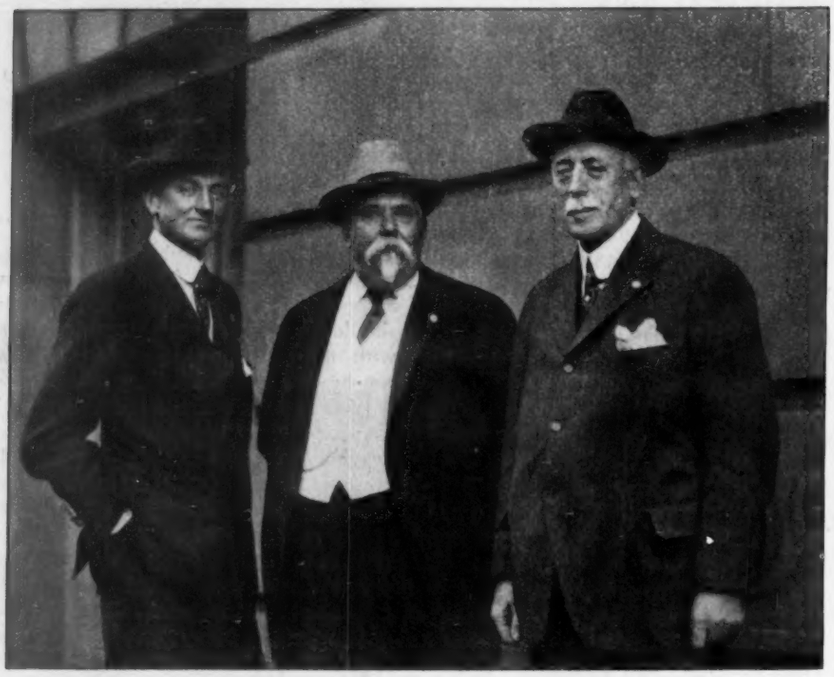
A discussion of a paper entitled, "Mechanical Developments of Sintering Iron Bearing Materials," by Bethune G. Klugh, presented at the Cleveland meeting of the American Iron & Steel Institute, Oct. 22, 1915. The paper in full appears on page 835 of this issue. The author of this discussion, H. A. Brassert, is superintendent of furnaces, South Works, Illinois Steel Co., Chicago.

Many Attend Institute Meeting

Record Number Register and Attend Banquet—Spirit of Good Will Prevails—Sweetser Tells Value of Advertising

"LET US not forget one another. No matter how keen the competition, let us always remember that we are friends."

With these closing words, Judge Gary addressed the members of the American Iron and Steel Institute at the end of the program of the banquet last Friday evening. The words were typical of the spirit which pervades the institute and never have there been more good fellowship and more hearty relations than at the present time. The meeting was a record breaker in attendance, there being 680 registered, and it was in every particular one of the most successful in the history of the institute.



J. A. BURDEN, WILLIS L. KING AND JAMES A. FARRELL

The first session was called to order Friday morning at the Hotel Statler by Judge Gary, or, more correctly speaking, the meeting called itself to order by applause when Judge Gary arose. The large meeting hall was filled and a goodly number were in the balcony and very close attention was given to the judge's address. It was rather significant that the first applause greeted a quotation from the bible, "For none of us liveth to himself, and no man dieth to himself." The next hearty applause was when the judge declared that it would be necessary to protect American industries from the dumping of large quantities of materials by the belligerent nations after the war is ended. Judge Gary's address will be found in full elsewhere in this issue.

Samuel Mather, Cleveland, was introduced as the first speaker and in an extremely interesting manner told of the greatness of Cleveland and of its interesting history. Liberal extracts from his address will be found elsewhere in this issue.

Thaddeaus F. Baily, president of the Electric Furnace Co. of America, made a hit not only in the reading of his paper on the "Electric Furnace for Heating Billets, Castings, Etc." but also by the presentation of moving pictures showing the actual operation of the furnace. The other papers presented, which will be published either in full or in abstract in this or later issues of *The Iron Trade Review*, were as follows: "Modern Methods of Burning Blast Furnace Gas in Stoves and Boilers," by Ambrose N. Diehl, assistant general superintendent Carnegie Steel Co., Duquesne, Pa.; "The Developments of Alloy Steel for Commercial Purposes," by Edgar D. Rogers, general sales manager, United Steel Co., Canton, O.; "Under-Advertising of the Steel Business," by George H. Jones, vice president, Inland Steel Co., Chicago; "Recent Developments in Sintering of Iron Ores," by Bethune G. Klugh, engineer, American Ore Reclamation Co., New York City; "Casting Steel Ingots," by Henry M. Howe, emeritus professor of metallurgy, Columbia University, New York City. Dr. Howe was not present and his paper was read by Secretary McCleary.

Mr. Jones said that England had raised the greater part of an army of 4,000,000 men by advertising and had furnished an object lesson to the iron and steel manufacturers, who have been in the habit of saying about advertising, "When the demand for our products is good, there is no need for it, and when the demand is poor, there is no use for it." He said that the steel manufacturers could pave the way to make depressions less severe by stimulating the demand for the products of steel mills. Instead of merely placing a card in a trade paper, he advocated close attention to advertisements, so that they would be read. He quoted from the statement made by Edward M. Hagar at the May meeting of the institute that if the manufacturers of steel would spend as much money to instruct the people in new uses for steel as have the manufacturers of cement in proportion to the dollars of business done, the steel men would be spending $12,000,000 per year to extend the uses of their products.

After the reading of the papers had been concluded and there had been considerable discussion of them, Judge Gary said that the meetings constantly impressed him because of the freedom with which information is given by the different manufacturers to each other and to the public. He said that never had there been a better feeling in the institute and never had the institute done better work in placing business on a high plane. He expressed his hearty appreciation of the part which the younger men are taking in contributing papers of great value.

The Banquet

The banquet, which was held Friday evening at the Statler, was a brilliant event. The guests were seated at 70 tables with 10 at each table. Moving pictures showing processes of

manufacturing at plants of the National Tube Co. and the American Steel & Wire Co., and also giving an idea of the welfare work done by the Tube company, were a prominent feature of the evening, and after that had been enjoyed Judge Gary called on a number of prominent members of the institute for short addresses. Ralph H. Sweetser, president of the Thomas Iron Co., Easton, Pa., gave an exceedingly interesting talk on the value of advertising. He said that a year or so ago when he became convinced that it would pay to advertise, an advertising manager told him to go ahead and tell the truth about the products which he wished to advertise. He said the result had been highly satisfactory. His company had advertised vanadium pig iron and its sales had increased rapidly while the prices it obtained had advanced. The company enjoyed business which had been going to other furnaces. Carefully conducted experiments made at Lafayette college had demonstrated the truth of the claims as to the value of vanadium in pig iron.

D. B. Meacham, of Rogers, Brown & Co., Cincinnati, spoke of the broad vision and high ideals of the men who are carrying on welfare work in the United States and said that the giving of comfort and pleasure to others is a source of abiding joy to the giver. He gave an interesting outline of work which is being done in connection with industrial plants by the Y. M. C. A.

W. S. Horner, Pittsburgh representative of the American Rolling Mill Co., severely criticized methods of sales in vogue in this country. He condemned the practice of making contracts which amount to nothing more than options and are freely repudiated whenever the buyer wishes to do so.

Julian Kennedy, Pittsburgh, paid an eloquent tribute to the greatness of Cleveland, and spoke in terms of high praise of Tom L. Johnson, a man who, he said, was not fully appreciated while alive. Mr. Kennedy denounced the idea of undue expenditure for armament. He said that great armies and navies bring war, and he was opposed to militarism.

Col. H. P. Bope, vice president of the Carnegie Steel Co., Pittsburgh, eloquently combated the position taken by Mr. Kennedy as to being prepared for war. He said he favored the right kind of preparedness, and the audience enthusiastically applauded.

When Col. Bope concluded, Judge Gary said, "We all love peace. I do not believe there is a fundamental difference between Mr. Kennedy and Col. Bope."

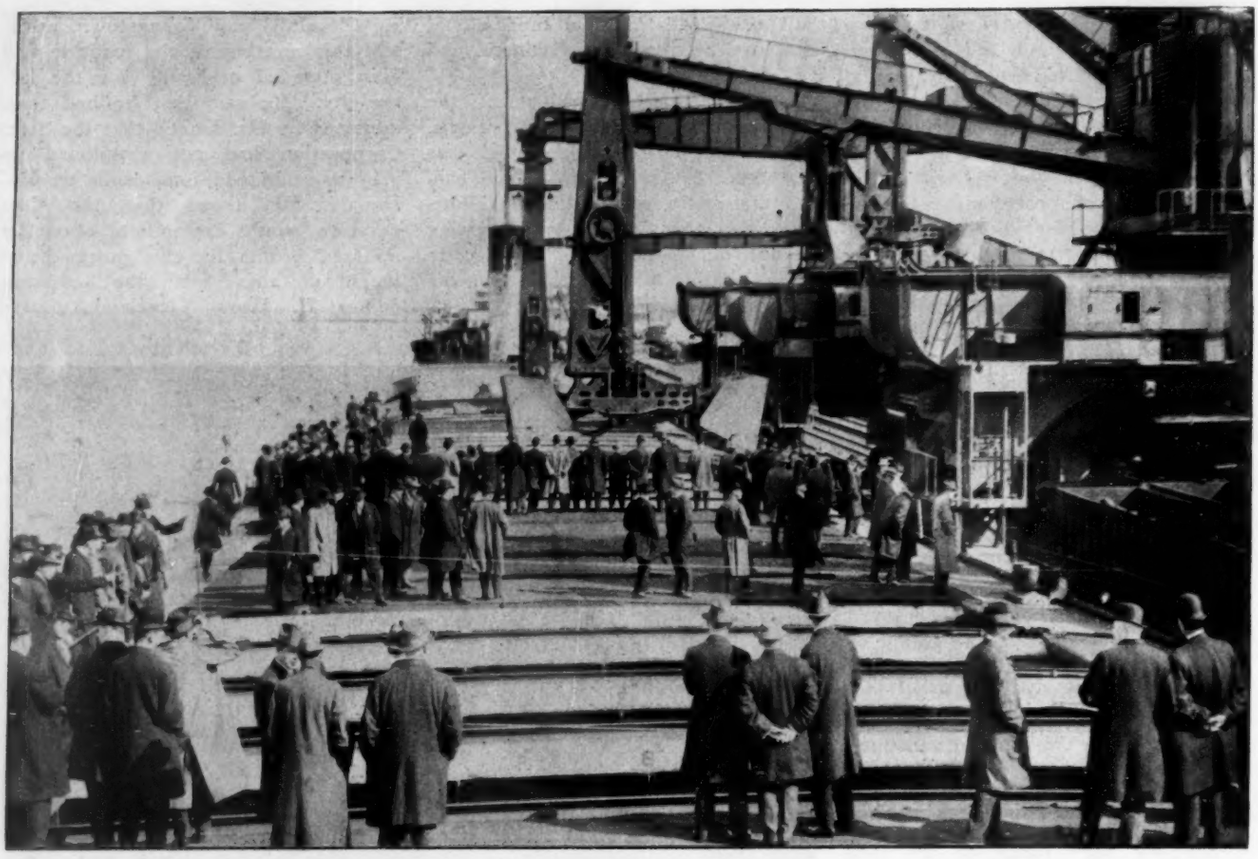
C. H. Howard, president of the Commonwealth Steel Co., St. Louis, told of the welfare work which has been done by his company and said he preferred to speak of it as fellowship. He gave a most interesting account of the methods adopted to bring about a better feeling between the company and its employes.

TWO GREAT ENGINEERS—JULIAN KENNEDY AND SAMUEL T. WELLMAN

President Palmer, of the American Steel & Wire Co., Cleveland, spoke briefly on salesmanship and said that steel men are "punk" sellers, for they give the buyer the advantage in four cases out of five.

"Uncle Joe" Butler, of Youngstown, was called for by the audience when Judge Gary gave the banqueters a chance to name a speaker from whom they wished to hear. Mr. Butler made an exceedingly witty speech, contrasting Cleveland and Youngstown, as he said this meeting of the institute had been intended originally for the latter city. He said that he had been informed by Mr. Farrell that the Steel Corporation had not abandoned its plan to build additional mills at McDonald. He hoped that the Corporation would appropriate about 35 minutes' profits for this purpose and would go ahead with the buildings. James H. Hoyt, Cleveland, always a favorite at these meetings, was called upon and spoke eloquently in favor of a policy of preparedness, and also for protection against the products of foreign countries.

President Farrell, when his name was called, said he would confine his remarks to a suggestion which had been made to him, and which he endorsed, that any member knowing of members who were willing and able to present papers at the insti-



MEMBERS OF THE INSTITUTE WATCHING THE UNLOADING OF THE J. P. MORGAN

tute meetings should hand their names and subject to Secretary McCleary.

Willis L. King, vice president of the Jones & Laughlin Steel Co., Pittsburgh, advocated a revision of the tariff. Homer D. Williams, the newly chosen president of the Carnegie Steel Co., spoke in response to many calls.

Saturday morning, several hundred members of the institute were taken in automobiles to the plant of the White Co. A special train then took the members to the Pennsylvania ore dock, where the unloading of the J. P. MORGAN, of the Pittsburgh Steamship Co.'s fleet, was in progress, and thence to the Country Club, where lunch was served.

Facts About the Pennsylvania Ore Docks

West Basin, Cleveland harbor.
Four Hulett solid arm unloaders.
One Hulett storage bridge.
Electric power.

Each unloader, approximately, weighs 550 tons.

Bridge, weighs approximately, 1,000 tons.

Loaded bucket of 17 tons capacity, from vessel, discharges into a hopper of 75 tons capacity, located between the girders of the main structure. The ore is drawn from this hopper into a scale hopper, of 50 tons capacity, located on running track between girders below the receiving hopper. This running track extends over the four loading tracks and the concrete receiving pit beyond. The ore thus drawn is weighed and contents then discharged into the railroad car below. Car has been carded in advance and as soon as the weighed ore is discharged into it, it is ready for movement to its final destination. When ore from vessel is to be placed in storage, the weigh car proceeds up the runway to the concrete pit and there discharges.

The unloaders have a bucket capacity of 17 tons each, and the entire plant in operation has a capacity of 3,000 tons per hour in unloading a modern vessel in its entirety. The record unloading on this plant was made on July 2, 1915, on the Steamer JAMES A. FARRELL, when 11,083 tons were unloaded in 3 hours, 35 minutes, the vessel being tied to the dock only 3 hours, 40 minutes.

The average annual receipts of ore at the port of Cleveland for the past ten years have been 6,242,383 tons.

The annual capacity of this plant in unloading vessels is approximately 7,000,000 tons.

The cars under this plant are handled by electric locomotives running on a narrow gage track, located between two railroad tracks, one locomotive handling the cars on the tracks on either side, by application of arms controlled by air pressure, to the end sill of the cars. These electric locomotives are positive in the spotting of cars, and have a capacity of moving 20 loaded cars or 35 empty cars without effort. The locomotive weighs 25 tons.

This bridge is used for taking the ore which has been discharged from the vessel into a concrete pit in the rear of the unloaders and storing it on the proper pile in the storage yard beyond. The capacity of this storage yard is 1,000,000 tons. The bucket has a capacity of 15 tons and a daily average capacity of 5,000 tons. The bridge is also utilized in loading the storage ore into cars, and is equipped with a storage hopper and weigh hopper the same as referred to in the unloaders. The bridge is 612 feet long, having a center span of 266 feet, and stands 90 feet from the ground to the bottom chord.

Publicity Would Prevent War

Masses, if Informed, Would Stop the Conflict

Judge Gary in Address Before American Iron and Steel Institute Says Publicity Has Never Done as Much Harm as Secrecy

"THE Public Be Damned". Many years since it was openly charged that this expression was used by a business man of great prominence. There has been a prevalent belief that the charge was based on fact and it has caused a feeling of prejudice which has been exceedingly harmful to the business interests of the country.

It is doubtful if the statement was ever made by any one of great importance, particularly by the gentleman to whom the same was attributed. Whatever the truth may be in regard to this well-advertised and much-discussed expression, it is no doubt true that the sentiment which it conveys has in days gone by existed in the minds and actuated the conduct of a considerable number of the leading business men of this country and other countries during various periods of their history. Included in this class are men of intelligence and influence in all the various departments of industrial activity.

Within a few years, comparatively speaking, we have listened to the arguments of distinguished business men who insisted that if they violated no rule of law, if they withheld from the public nothing which the law positively and affirmatively compelled them to disclose, they were without fault, even though a large portion of the public might be adversely affected by a failure to reveal information which might be received in an official or fiduciary capacity or as the result of circumstances which gave to an individual a decided advantage over others. Most of us know of cases where officers of corporations have acquired wealth by acting for themselves to the prejudice of others who were interested and were not in a position to protect themselves because of the lack of publicity. Some have dealt, to their great advantage, in the markets of the world upon advance knowledge of what might be expected as the outcome of conditions or facts not generally known at the time and before the facts were communicated even to the other stockholders. They violated no rule of law and, probably, in their opinions, no rule of moral conduct. This is a charitable view to take.

It has in the past been considered by men of probity and high standing that private corporations, so called, as distinguished from public or quasi-public corporations, were literally private and that the public had no greater right, legal or moral, to inquire into the affairs of the corporation than it had to question the personal matters of the individual or family. Sometimes the management of corporations, including the boards of directors, have withheld from the general public facts which directly affected the public interests, and even though no rule of law was violated, yet widespread harm was done. In many cases men of prominence and influence have been totally indifferent and defiant when considering the public welfare.

It is needless to say that, because of this attitude on the part of some of the business men, the whole fraternity has been seriously affected and has suffered unjustly. For a period of years big business, so called, the good with the bad, was antagonized to an extent which materially interrupted its normal and legitimate progress; and it is believed this was occasioned in part by the suspicion created from the failure to take the public into the confidence of private enterprise so far as practicable and proper.

The general public and private individuals have been in the past too far apart for the good of both. Lack of knowledge often breeds unnecessary and hurtful antagonisms, and many have suffered even though they were not personally at fault.

Principles of Proper Publicity

These casual remarks are preliminary to a brief discussion of the topic of publicity which is one of the most important questions of the day. Much has been said and written upon the subject during the last few years, and apparently there have been contrary opinions. It is believed, however, that there is really not much difference in the minds of intelligent and fair-minded men as to what is desired, although in the consideration of any important question there will be found those of extreme views who, on one side or the other, will insist upon that which is unreasonable. If the public is approached in a fair spirit it will generally reciprocate.

There are from time to time many facts in private business, some of great importance, which cannot properly be made public and ought not to be insisted upon. All who are present know by actual experience, and every other intelligent person will recognize the fact, that in current business affairs where competition is essential, there are always a great variety of questions which must be treated as private and withheld from publication in order to stimulate business and accomplish success. This is and will always be the rule, though there may be exceptions in order to meet the exigencies of special conditions. If a man in business should open every detail to the inspection of all others he might seriously interfere with his own progress and benefit no one, except such as might be disposed to profit unfairly at his expense; while, if he declined to disclose these private matters, nobody would be injured. Neither the public nor any one except the individual person or corporation involved is entitled, on any ground, to possess the kind of information now under discussion. It is not necessary to specify the facts pertaining to individual affairs which are strictly private; any man may apply the principle to his own matters. Perhaps it is impracticable to draw a definite line between the facts which should be given to the public and those which may be considered private; and quite probably there should be an impartial public tribunal to determine; but this is another question. "The public" as used might comprise large or small numbers.

It is not practicable to determine a standard for publicity which is exact and applicable to all cases. Circumstances and conditions must be considered; but a general rule may be stated thus: There should be

published whatever of business matters the public is legally entitled to know and also whatever may affect the public interest and may be exposed without detriment to the corporation or individual concerned.

Proper Legislation Regarding Publicity

Legislation or administration of laws or any practice of governmental agencies that seeks to go further than this rule is vicious and should be condemned. I believe thoroughly in publicity, so far as it is practicable and proper. We should not be like owls. It should go without saying that the officials of a corporation ought to keep the stockholders promptly and fully informed, so far as possible, without damage to its current business. They have no moral right to profit individually to the detriment of other stockholders as the result of information officially obtained.

However, during the present decade there has been a pronounced change in the attitude of large business interests concerning the disclosure of facts and figures to the general public. Many now, voluntarily and without the requirement of law, make regular and complete reports so that anyone interested may know the results of the business and the general policy of the company; and whenever requested by representatives of the press they furnish facts in corroboration or denial of rumors which are considered important when the information can be given without prejudice to the business and appears to be of concern to the public. Probably it will not now be denied that the average business man is quite disposed to be accommodating in this respect.

Wisdom of Reasonable Publicity of Business Affairs

And what follows? It will not be questioned that the great business interests of the country have been benefited by this change in disposition toward the public which has become less distrustful of capital and its controlling influences. It has been more considerate of the rights and claims of those engaged in great enterprises and less inclined to listen to the plea of the demagogue. Indeed, it has patiently and fairly heard and read all that has been said in favor of granting relief to any concern that sought assistance on a fair and reasonable basis; and not infrequently, because of a public sentiment that the request was just, it has been granted. Included among those who have seemed to change their opinion toward the business interests are multitudes of wage earners, of business men of small means, of educators, lecturers and editors, of the leading thinkers, writers and public speakers of the country. There is abundant evidence that at present the great general public is willing to meet half way the individual or the corporation in the determination of all questions that affect private or public interests.

Is it too much to urge that from every standpoint it pays the business man or any man possessed of information which affects the public weal, to disclose the same so far as practicable and reasonable? Is it too much to insist that publicity is the cure for many of the ills from which the country has been suffering in the past? Publicity has never done as much harm as secrecy. The individual or the corporation with a disposition to publish whatever facts were proper to be known has, without many exceptions, been treated justly; while those who have been defiant, arrogant and secretive have suffered. So far as I can see, the great business men of this country are, at the present time, in close contact with the public. They are striving to work together for the good of all. We shall see great and favorable results.

These observations relating to private men and enterprises apply with equal force to public officials, to municipalities, states and governments. The public is entitled to know what public officials are doing and what policies are being considered or enforced, though, of course, it may, and often does happen, in individual cases, that information cannot be generally given out without injury to the cause involved; and in such cases the responsible official must withhold publicity temporarily, and, possibly, in some cases, permanently. It is fair to say, public officials have often been as indifferent to the rights and interests of the general public as private officials or persons have been. It would be better for all concerned if the officials of municipalities and even states and countries were more inclined than they have generally been to confide the knowledge in their possession to the people at large.

Proper Publicity Would Have Prevented Present War

This idea has peculiar application to the present situation in Europe. If the masses of the people of the different nations engaged in the terrible conflicts that are now waging in Europe were fully informed of all the facts, is it to be supposed the wars would be much longer continued? If they and every one of them, in the armies or at home, knew, as now published in our newspapers, that the daily cost of the war is eighty-five million dollars, or at the rate of thirty billions per year, an annual interest burden, at 5 per cent, of one billion five hundred million dollars, and that the indirect loss is about as much more; if they were aware that, on the basis of the war being prolonged to next February, there will have been killed in battle at least five million men, deaths from sickness two million five hundred thousand, and permanently crippled five million more—and these the very best; if they could see that 75 per cent of the men in the armies who survive will never fully recover, physically or morally, from the effects of their service and association; if they realized that their countries are drifting, nay, speeding, into bankruptcy and must necessarily hereafter and for many years be at a decided disadvantage in the race with other nations for progress and success; if they understood that on the present basis of pension payments in the United States the amount to be paid for this purpose in consequence of the war will approximate one billion dollars per year; if the leaders, the monarchs, the few who plan and control and command and know in advance and in detail what has been and is being done and is intended for the future, were to communicate all the facts to the public, when it could be done without prejudice to the daily conduct of the war; if all these startling facts and figures were of universal knowledge, would not the masses of the people, including the soldiers in the ranks, rise up in such vigorous protest against a continuance of the conflict as to compel the men in control to find some way of bringing it to a satisfactory termination and for the establishment of a basis which would prevent future, prolonged wars? If, indeed, before the wars were started the masses of the people of the different countries had been informed that wars were to be started, and the reasons or lack of reasons for starting them, would they have submitted to their precipitation?

It is not too much to demand that the people should know the reasons for the commencement and the continuance of the pending wars and they should

understand the awful consequences. Those who are directly affected and must bear the burdens are, in a large measure, ignorant of the facts which have been suppressed, partly at least, because knowledge of those facts would prevent a continuance of the most stupendous, if not the most unreasonable, destruction of life and property the world has ever witnessed.

I leave this subject by proposing as a substitute for the quotation referred to at the beginning of these remarks the following from the Bible (Romans XIV:7):

"For none of us liveth to himself, and no man dieth to himself."

The business men of this country, particularly those engaged in the iron and steel trade, have reason to be thankful for the present conditions, which are very prosperous. The furnaces and mills are generally operating to full capacity and prices received for many, if not most, of the commodities produced are larger than they have been during the last few years and should result in profits.

We are at peace with all the world and it seems likely that the wise policy which has permitted this state of affairs will be continued. We sincerely hope and pray that the wars which are raging in Europe may soon be brought to a close and a basis reached for the prevention of prolonged wars in the future.

Apparently we are to have a period of industrial peace in this country. Many of the antagonisms, which have hitherto been so hurtful and which have prevented natural business growth, have disappeared and legitimate business will, therefore, have opportunity to progress in accordance with its deserts.

No doubt the sudden and marked improvement in conditions during the last six months is due, in a large measure, directly or indirectly, to the purchasing necessities growing out of the wars; but there are other reasons.

The total wealth of the United States, according to the last published figures, is more than one-fourth of the aggregate of all the nations and it is rapidly increasing. Many of us believe that we may become and remain the leading nation, financially, commercially and industrially, provided nothing unnecessary is done by our people to prevent. Personally, I do not agree with the statements which have been made that, at the close of the wars, we may expect in this country a prolonged continuance of the great prosperity now experienced; especially if we do not have protection against the results of cheap labor and the impoverished conditions abroad, which are inevitable. I do think that, with wise administration and with the co-operation of the state and national governments, our industries will be able to recover from the injurious effects of the wars much more rapidly than those of any other country, and that within a few years we shall be more successful than ever before.

The value of good crops we all understand and appreciate. Evidently the seasons' crops are, in most respects, excellent and with a good market therefor the farming communities will be prosperous and the country at large will be benefited.

The American Iron and Steel Institute is to be congratulated on the good work it is doing and the high reputation which it deserves and has secured and particularly on the splendid services which are being rendered by the young men, including those who are producing at our meetings, for our benefit, most admirable discussion of various topics which directly affect our industry.

The Bulk Freight Traffic of the Great Lakes

The steamer J. PIERPONT MORGAN, *which was unloaded, Saturday, Oct. 23, is one of the vessels of the United States Steel Corporation Fleet. This ship is one of 21 boats of approximately similar dimensions belonging to the Steel Corporation.* J. P. MORGAN *was built at Chicago in 1906, by the American Shipbuilding Co., and is of the following dimensions:*

	Feet.
Length overall	600
Breadth	58
Depth	32

The average speed of this vessel loaded is about 10¾ miles per hour. The largest cargo she has carried is 11,665 gross tons. In a single season she has moved 297,001 tons of ore.

The cargo of J. P. MORGAN *unloaded consisted of 10,770 gross tons of Savoy ore. This cargo came from the Vermillion range mines of the Steel Corporation and its analysis after drying at 212 degrees Fahr. was about as follows:*

	Per cent.
Iron	62.50
Phosphorus	0.04
Silica	6.55
Manganese	0.12
Moisture	6.20

The Steel Corporation operates in the bulk freight trade on the Great Lakes, through its marine department, which is incorporated as the Pittsburgh Steamship Co., a fleet of 72 steel steamships and 21 steel tow barges.

The steamships have a total single cargo capacity of 560,000 tons, the barges of 128,000 tons, which gives the fleet of 93 ships a total capacity of 688,000 tons, making the average per ship 7,400 tons. This fleet has moved in a single shipping season, which is about seven months on the Great Lakes, a total of 17,000,000 gross tons of freight, consisting principally of iron ore. The average round trip is made in about nine days and covers a distance of approximately 1,600 miles to and from ports on Lakes Erie and Michigan and on Lake Superior which are from 600 to 900 miles apart.

Recently the rate per gross ton for carrying iron ore from ports of loading to ports of discharge has averaged 39 cents free to the ship, the average sailing distance with such a cargo being approximately 800 miles. The sailings westbound are usually without cargo, as of the total cargo movement iron ore eastbound approximately 91 per cent.

The operation of the fleet gives employment to 2,150 men. Wages make the largest single item in operating costs.

In the 14 years which cover the history of this fleet there have been a total of 17 lives lost from accidents due to navigation hazards.

Employes' families are protected by an accident relief fund, and retirement of old employes is provided for under a pension system.

Total shipments of iron ore via the Great Lakes from the beginning in 1885 to the close of the present navigation season will total approximately 700,000,000 tons. More than half of this tonnage has come from the Missabe range, from which range shipments were begun in 1892.

In 1855, the year of the first ore shipment on the lakes the freight rate was $3 per gross ton and in 1866 it went as high as $4.17. From that year to the present time the rate has steadily declined, the low point being reached in 1908, when it was 40 cents and that is the rate again this year, from the head of Lake Superior to Lake Erie ports.

In 1913 the greatest single year's bulk freight movement on the lakes was attained. In gross tons this movement was approximately as follows:

	Gross tons.
Ore	49,100,000
Hard coal	5,000,000
Soft coal	25,300,000
Grain	10,100,000
Total	89,500,000

It is estimated that the ore movement via the lakes this year will approximate 45,000,000 gross tons.

Mather Welcomes the Institute

Telling of Cleveland's History and the Development of the Steel Industry—Causes of a City's Greatness

BY SAMUEL MATHER

THOSE of your membership resident here in Cleveland are delighted to extend to you a most cordial and hearty welcome. We are very much pleased that you elect to have your October meeting here; and, while no public reception by the mayor, or the chamber of commerce, or the citizens of Cleveland generally, has been arranged for, yet I assure you it is not because they fail to appreciate the honor of your coming, but simply because the resident members knew from past experience that your time would be entirely taken up in the transaction of your own business, and in the sight-seeing trips that have been planned for tomorrow.

The subject that has been given me for my short address is, "Cleveland and Its Industries". Like most American cities west of the Alleghenies, Cleveland has no long history to look back upon; she is still in the heyday of youth. At the conclusion of peace with Great Britain, after the revolutionary war, the vast area lying beyond the Allegheny mountains and bordered on the west by the Mississippi river, belonged generally, of course, to the 13 states. There were many claimants to this vast tract of land, but by 1785 all of these claims were amicably settled, excepting those of Connecticut; but after considerable controversy, congress settled with Connecticut also, by deeding to her the land between the forty-first and forty-second degrees and two minutes north latitude, for a distance of 120 miles west of the western line of Pennsylvania. This tract of land was the famous "Connecticut Western Reserve", which became within a quarter of a century after its creation, the home of a transplanted New England. Part of this tract, at the extreme westerly end of the reserve, was donated to those citizens of Connecticut who had suffered by the burning of their homes by the British during the revolution. The remainder was sold, in 1795, to some 35 or 36 citizens of the state for $1,200,000. These purchasers pooled their interests and formed the Connecticut Land Co. The following year —1796—they sent out a surveying party under the command of Gen. Moses Cleaveland, of Canterbury, Conn., which party arrived at the mouth of the Cuyahoga river on July 22, 1796, and on the 16th of September, of that same year, began there survey of the land where the city of Cleveland now stands.

While, no doubt, it would be overlooked by you, yet I feel I should hardly be pardoned by my fellow-citizens, who may be present, if I delayed longer to mention the fact that Cleveland is at present the sixth city of the United States in population, which was estimated by the United States census bureau here on July 1, 1914, at 639,431; and the fifth city of the United States in the value of manufactured products, according to the United States census of 1910. It was in 1820 that the village of Cleveland was incorporated, with a population of 606 inhabitants; and it was in 1832 that the canal from Cleveland to Portsmouth on the Ohio river—a distance of 309 miles—was completed, which gave Cleveland its first impetus of growth through the facilities of communication with the other portions of the state thus obtained.

First Manufacturing Concern

In 1834, the Cuyahoga Steam Furnace Co. was incorporated under the first state charter issued to a Cleveland manufacturing concern, and it was the first iron industry in Cleveland or vicinity to use steam instead of horse-power for "blowing" its forges and furnaces. In 1841, this company made cannon for the United States government, and at this plant was built the first locomotive used by the Cleveland, Chicago & Cincinnati railway; and there also the machinery for the first successful lake screw propeller, called the EMIGRANT, was built.

Ship building on the lakes received its first impetus from the war of 1812, when ship carpenters were brought to the lakes to build the staunch fleets that added so much to the glory of American valor. From this early beginning, ship building in Cleveland and the neighboring harbors progressed, slowly at first, until after the opening of the Sault Ste. Marie canal, and then more rapidly, until in 1882 the first iron freight steamship intended for the carrying of ore and grain was built in Cleveland by the Globe Iron Works, and called the ONOKO. At the present time Cleveland is the headquarters of the American Ship Building Co., and at the works here and at neighboring Lorain, Cleveland outranks all other American cities in the production of steel ships.

It was undoubtely owing, however, to the discovery of copper, and more particularly iron ore in the upper peninsula of Michigan, which latter was first discovered on Sept. 19, 1844, at the Jackson mine, Negaunee, and to the opening of the Sault Ste. Marie ship canal, in 1855, that contributed most to the great growth of Cleveland; for this city then became the natural meeting place of the bituminous coal from the coal fields of southern Ohio, Pennsylvania and West Virginia and the iron ore from the Lake Superior district. The Jackson Iron Co. shipped the first ore in six barrels, in 1852, but the Cleveland Iron Mining Co., in September of the following year, shipped the first cargo of ore, amounting to 152 tons, to the Sharon Iron Co., Sharon, Pa. This, of course, was before the completion of the Sault Ste. Marie canal, and it was portaged over the falls. From this small beginning has sprung this vast industry, so familiar to all of you, until in 1913 the shipments amounted to between 49,000,000 and 50,000,000 tons, and the size of the boats has increased from 152 tons to boats of the class that you will have the opportunity to inspect unloading tomorrow, with a capacity of 13,000 tons.

Between 1850 and 1860, Henry Chisholm and the two Otises, William A. and Charles A., started their iron and steel works; that organized by Mr. Chisholm becoming the Cleveland Rolling Mill Co. and today being a part of the American Steel & Wire Co., and that organized by the Otises having become the Otis Steel Co. I am advised that the first bessemer steel blown at Mr. Chisholm's plant, in Newburgh, on Oct. 15, 1868, was prior to the making of bessemer steel in Pittsburgh by several years.

It was in 1860 that we find the first suggestion of the petroleum industry, novel at that time, of which Cleveland was the cradle, and with whose astonishing history the name of this city is inseparably associated. In 1861, John D. Rockefeller and Henry M. Flagler formed their partnership, and in

(*Continued on Page* 860.)

Abstract of address on "Cleveland and Its Industries", delivered by Samuel Mather at meeting of American Iron and Steel Institute, Cleveland, Oct. 22, 1915.

Utilization of Blast Furnace Gas

Discussion of Modern Methods of Burning This Gas in Stoves and Boilers—Results of Numerous Tests

BY A. N. DIEHL

FROM carefully calculated balances, it is shown that about 48 to 50 per cent of the thermal value of the fuel used in the blast furnaces passes from the top in the form of sensible and latent heat in the gas. Our efforts to lower fuel ratios, aside from raw material improvement, have been principally in increasing hearth temperatures. This increment is best obtained by hotter blast, therefore better and more efficient contact, with the brick work of the stove.

In order to accomplish this, about 30 per cent of the gas generated per ton of iron is used, allowing 60 per cent to be used in boilers or engines and a 10 per cent loss. The desire for higher heats thus forced better stove construction and combustion into prominence, as an indirect means of lowering coke consumption. However, the saving of 12.3 cents per ton of iron by increasing boiler efficiency from 55 to 65 per cent in burning the other 60 per cent of the gas has been overlooked. It has only been recently that anything but spasmodic furnace gas boiler tests have been made, and these only for passing information. Practically no recognition was given them, except to acknowledge conditions were bad, and but few attempts were made to correct the discrepancies which the tests revealed. The tests seldom reflected usual operations since boilers were often overhauled and repaired for starting, giving erroneous ideas of the general prevailing condition.

Although great savings are possible by the efficient burning of blast furnace gas, yet to the minds of the majority of operators, it was a problem of minor importance, as pig iron was the commodity desired and the gas at best only a necessary adjunct. Coupled with this idea, was the fact that all furnaces will produce more than enough gas for their own auxiliary power equipment, even with the crudest boiler arrangements. So it would not be worth while to expend thought or capital for unnecessary efficiency for the privilege of opening the bleeder a little further. This accounts for so little engineering judgment used in many installations. Within the past few years, the economy of higher heats as well as the repairs and expenditures in stove practice, have most clearly demonstrated the economic value of further cleaning the gas. This can be done in various ways. A dry filtration method has been working with apparent success on the continent, but does not have to contend with the large percentage of fines, which the American Mesabi practice has to contend with. Wet mechanical washers are in use, but the simplest is a spray tower with provisions for the prevention of gas channeling. It is necessary in this case to use sufficient water to not only remove the dust, but also to cool the gas low enough to remove excessive moisture. If the gas is not cooled after being subjected to water contact, the moisture content is such as to either prevent combustion or carry the thermal losses in the stack so high as to make the operation decidedly uneconomical. By proper washing, the dust is lowered from 3 grains to approximately 0.2 grains per cubic foot and the moisture from 30 grains to 11 to 12 grains. The lowering of the gas temperature from 300 degrees to 80 degrees robs it of 220 degrees of sensible heat, which is balanced by the gain due to reduction of moisture and dust, and the resulting cleanliness of heating surface. Tests conducted at Duquesne show that equally high flame temperatures can be obtained from either clean or dirty gas. The average combustion chamber temperature from 19-24-hour tests on clean gas was 2,040 degrees Fahr., and from 8-24-hour tests on dirty gas 2,030 degrees Fahr.

An Able Summary

The accompanying article is an abstract of the principal features of a paper on "Modern Methods of Burning Blast Furnace Gas in Stoves and Boilers", presented by A. N. Diehl at the Cleveland meeting of the American Iron and Steel Institute, Oct. 22. Mr. Diehl's paper is exceptionally complete and discusses results of exhaustive tests made on the proper utilization of blast furnace gas, with particular relation to burner construction. The data presented and the tests made are of unusual interest and value. Mr. Diehl recently assumed the assistant superintendency of the Duquesne works of the Carnegie Steel Co. The paper will be published in full in early issues of The Iron Trade Review.

Blast furnace gas is made to yield its energy in three principal ways:

1. By combustion in recouperating chambers or stoves for the purpose of preheating the blast;
2. By combustion under boilers for steam generation;
3. By combustion in gas engines, for blowing or power generation.

In all of the above divisions the first principle to be applied is the supplying of sufficient oxygen to just complete the oxidation of the several combustibles present. Excess of air results in the dilution of the products of combustion, consequently in the lowering of flame intensity, and the carrying away of a corresponding quantity of heat units in the stack gases. Insufficient air results in the lowering of flame intensity due to incomplete combustion and the loss of calorific value of the gas in the stack and does not compensate the gain due to the lesser weight of the flue gas. Thus it is obvious that for efficient combustion a proper mixer or burner is of primary importance.

There have been very few operators who have not at one time or another put one or more pipes through a stove or boiler burner in order to get the so-called Bunsen effect. In the case of stoves these experiments generally terminated in two results. First, if the air duct was sufficiently large to effect any decided change, the temperature of combustion was considerably increased and resulted in the flue dust, carried with the gas, fluxing with the brick in the combustion chamber, and either boring a hole through the same or filling the well with semi-molten or plastic material. Second, the stove from which a high temperature was obtainable, at first, ran down quickly, resulting in the operator's statement that the stove merely had a "flash temperature but would not carry its heat". The air pipes generally occupied so much area that the normal supply of gas was decreased in consequence, and an insufficient thermal capacity resulted.

These efforts mostly resulted in failure, on account of the foregoing causes, and instead of burning down stoves by flame concentration, air was allowed to enter through special doors or blow-off valves. In this manner the proper mixing was intentionally spoiled and the consequent flame temperature lowered, to preserve the walls from the subsequent fluxing action. Many of these difficulties are avoided in burning clean gas and the temperature can be raised to its highest limit.

In the case of boilers, especially if air shortage was the prevailing condition, the placing of pipes or other aspirating devices around or through the burner, occasionally resulted in small increases in efficiency, due to supplying more nearly the required amount of air.

Burner Efficiency vs. Boiler or Stove

In the testing and development of gas burners, the performance of the burner itself is of much greater interest and importance than that of the combined unit of burner, and stove or boiler. On account of the difference in design of the different types, and the difference in condition and performance of the same, even in the same installation, it is both unfair and unreliable to judge the worth of a burner upon the basis of the combined efficiency of the stove or boiler on which it happens to be tested. The results obtained in this way have a direct application, at best, only to a similar type and size of the boiler or stove tested, and even then are not free from the inaccuracies which frequently occur in all but the most exact and pretentious forms of testing. For these reasons, it has been considered advisable to suggest the term "Burner Efficiency"; to define a standard by which the qualities of a burner alone may be judged; and to develop methods of testing with that object in view.

It is apparent that an ideal burner will admit the theoretically correct mixtures of air and gas, and completely mix them, thereby producing a maximum flame temperature at the point of ignition. The performance of a burner, on the basis of this ideal condition, may be determined by the observation of flame temperature, and by analysis of products of combustion, both methods being useful in practice. A couple, inserted in the combustion chamber, close to the point of ignition, furnishes both quick and reliable indications for the adjustment of air and gas openings in the burner, to continuously produce the best state of combustion. The highest temperature obtained in this way is not necessarily the theoretical maximum, but merely the maximum that can be produced by the burner under the prevailing conditions. The observed temperature will be affected by the radiation from surrounding bodies and the possible presence of carbon monoxide (CO) in the products of combustion. The calculated theoretical temperature will depend on the moisture in the gas and the accuracy of specific heat constants used. Therefore temperature observation can not be an absolute standard of burner efficiency, and a method based on analysis of products of combustion must be used. If the products analyze carbon dioxide and nitrogen, with no oxygen or carbon monoxide, the combustion is perfect and the mixing of the burner may be called 100 per cent efficient. The next factor to be determined is at what point in the path of the gases, this perfect condition should be reached. Theoretically it is directly at the outlet of the burner or ignition point, and a combination of these conditions would give a theoretical burner efficiency of 100 per cent. Practically, this is very difficult to obtain, and we must assume a point a short distance beyond the burner, but well in front of the first heat absorption surface. It is therefore suggested that, as a standard, a point two feet beyond the point of ignition be adopted as the point at which gas samples shall be drawn for the determination of burner efficiency, a water cooled sampling tube of course being used. The definition therefore becomes:—"A gas burner is operating at 100 per cent combustion efficiency when the analysis of a sample, drawn from a point two feet beyond the point of ignition, shows perfect combustion."

Special Mixing Burners

With the foregoing method, definite judgment may be passed on the comparative merits of different burners, but the question "Which, if any, special mixing burners would be advantageous?" is one which must be decided on a knowledge and appreciation of the details of equipment and operating conditions of the plant involved. If a boiler or stove has favorable conditions of pressure and draft, and a large mixing chamber, it may operate at a combustion efficiency approximately as good as could be obtained from the best mixing burner, in which case, new burners would not pay interest on the investment. Such operation is exceptional and generally requires very close regulation to obtain equal results. With the advent of clean gas the majority of furnace operators feel the need of mixing burners, and in such cases, where a comparison of burners is the problem, the most reliable and comprehensive information will be obtained by methods of test and calculation leading to the determination of burner and combustion efficiency. Unfortunately there is not sufficient data available to compare the burners, discussed in this paper, on this basis. Therefore, the combined stove and boiler efficiencies must be resorted to. While this is not as satisfactory, as has been stated before, at least in regard to sensible heat loss, the fact remains beyond all dispute, that the quantities of carbon monoxide (CO) present in the stack gases indicate very clearly the mixing possibilities of a burner.

Stove Conclusions

1.—Clean gas should be used when possible.

2.—Large heating surfaces should be exposed as an aid in lowering stack temperatures.

3.—Equal drafts and blast distribution over the entire checker area is essential to good practice.

4.—All gases should be consumed in the combustion chamber. The closer the complete combustion is to

Summary of Stove Tests

Plant	Type of Stoves	Size of Stove	Cu. ft. air per min. at 62 degrees	Burner	Efficiency	Remarks
Duquesne	2-Pass	21 x 96	40,580	Common	64.5	Average operation.
Edgar Thompson	2-Pass	22 x 100	37,774	Common	58.04	Actual efficiency probably higher as "radiation and unaccounted for" is excessive.
Edgar Thompson	2-Pass	22 x 100	34,926	Edgar Thompson	69.21	"Radiation and unaccounted for" normal.
Wisconsin	2-Pass	22 x 90	35,000	Common	61.50	Small checker area.
Wisconsin	2-Pass	22 x 90	35,000	Forced Draft	69.40	4,000 sq. ft. checkers added.
Ensley	2-Pass	22 x 110	49,700	Landgrebe	74.10	Very low stack temperature and biggest stove listed.
A.S.&W.Co. Cent.Fces.	2-Pass			Orr	65.00	Detail data not available.

the burner the better heat exchange is possible.

5.—It is best to add both gas and air at only one point, through the burner and control them there. Gas and air have channeling tendencies when entered separately.

6.—Forced draft will facilitate flame intensity and act in such manner as to make the combustion of more gas possible in the stove than under atmospheric conditions. If the stove is sufficiently large, considerable advantage can be derived by this method.

7.—It is advisable to make daily flue analyses, and have a technical supervision of the combustion.

Boilers

The boilers in operation at the present time in most blast furnace plants are small units, varying in general, from 250 to 500 horsepower. They are usually equipped with feed-water heaters, but rarely with superheaters or economizers. The settings are often leaky and the baffles in bad condition, and in nearly all plants, these most important details have been lost sight of until their presence and effect have been demonstrated by observations of flue gas analyses and temperatures. It would be safe to state that the efficiency of the average blast furnace boiler plant could be increased from 5 to 10 per cent by the repair and constant upkeep of settings and baffles.

The burner in general use, which will be referred to as the common burner, is a burner only in the sense in which the term might be applied to the open end of any gas pipe. The gas enters in a solid rectangle or circle and the air in a thin layer around it, no pretense being made of completely mixing the two elements before ignition. This work is left to the combustion or mixing chamber, which, unfortunately, shares the work with half or all of the boiler.

In the operation of this boiler equipment there has been little attempt at scientific regulation. The only method of controlling gas pressure and quantity is the butterfly valve placed in the supply line to one or two boilers. The function of boilers in a blast furnace plant is to burn as efficiently as possible the gas that remains after the constant quantity demanded by the stoves and gas engines have been supplied. The pressure in the system, where clean gas is used through a central cleaning plant, is controlled from there, upon whose signals the boiler operators vary the positions of the butterfly valves and therefore the quantity of gas burned in the boilers. This method of control is used in order to insure the required pressure at all times at the gas cleaning plant, and it is proper that the boiler plant should take the variations. This being the case, pressure regulations at the boilers is not to be considered, and the problem is to supply an amount of air always proportional to the quantity of gas available. With most equipments this can be attempted by means of a damper regulation, in combination with sufficient air openings around the burners. The adjustment of dampers, under present operating methods, is given very little attention, and, without intelligent supervision would be of small value. Probably the best results with the common burner would be obtained by automatic damper regulation, controlled by pressure in the gas box between the butterfly valve and the burner. By this means, more nearly correct amounts of air and gas would be supplied, thereby decreasing to some extent the losses due to large air excess when gas pressure is low and large quantities of carbon monoxide in the flue gas when the pressure is high. With present equipment, a good mixture of air and gas and the resulting high flame temperature are obtained only by constant and careful attention. However, regular testing is extremely profitable due to the increased efficiency obtained by repairs to settings and baffles, by regulation of the air supply in so far as this is posible, and because of its tendency to both educate and interest the working force in the matter of efficiency.

When rough gas is used, the regular blowing off of the boiler tubes assumes considerable importance. Observations of stack temperature (with all other conditions constant) before and after blowing tubes show decreases of from 50 degrees to 100 degrees Fahr., with an average of about 75 degrees Fahr., varying of course with the amount of dust in the gas and the volumes of gas burned. There is a loss due to excessive air leakage through open doors while tubes are being blown, and with this fact considered, it appears that the most economical period of blowing is every 12 hours, as it is after this length of time that the deposit accumulates rapidly, causing a correspondingly rapid rise in stack temperature. Where rough gas is used, the installation of permanent dust blowers may be found advisable.

The average efficiency of a blast furnace boiler plant, using common burners, and operating without the aid of technical supervision is not over 50 per cent and frequently much lower. The losses of 50 per cent are distributed about as follows: Sensible heat in waste gases, 36 per cent; CO in waste gases, 9 per cent; radiation, 5 per cent. This distribution varies greatly with load, gas pressure, and position of stack damper. The average result of 28 eight-hour tests conducted at the Duquesne blast furnaces, on several 250-horsepower B. & W. boilers is as follows:

Stack loss.....	35.7
CO loss.....	8.4
Radiation	5.0
Efficiency	50.9
B. H. P.....	300.0=120 per cent builders rating.

While these tests were conducted under operating conditions, the results may be considered slightly better than a continuous average, as observations were suspended during unusual periods, such as very low drops in gas pressure, etc. Also noticeable bad leaks in settings were patched before testing in many cases.

General Observations

While conducting boiler tests, primarily designed to study burner construction, it has been found difficult to separate the main question from the allied subject of heat absorption in boilers burning blast furnace gas. This investigation was made by placing a water cooled pyrometer successively at the top and bottom of each pass, the general condition meanwhile being held constant by means of pyrometers in the combustion chamber and stack. Results of such observations on several 250-horsepower Babcock & Wilcox boilers at Duquesne, a 500-horsepower Babcock & Wilcox boiler at the National Tube Co., McKeesport, and a 500-horsepower Stirling boiler at the Pittsburgh Steel Co., Monessen, Pa., show the desirability of high flame temperature, which results in a large proportion of the total absorption taking place in the first pass at a temperature range where rate of heat transfer is greatest. The McKeesport and Monessen results demonstrate the great advantage due to exceptionally tight baffling.

In the taking of the temperature in the different parts of the boiler, the areas were explored with the couple to find the highest temperature in order to make sure that no cooling influences in any way would affect the reading.

Operations with efficiencies over 70 per cent are rare, and while this may be done on occasion, extremely few can maintain it as an operating condition. Of a total of 60 blast furnaces in the Steel Corporation under observance, the tests and information

from the operators indicate a practice of not exceeding 55 per cent. The increase of 10 per cent probably possible with improved conditions, will show a yearly saving of $1,500,000.

Both the tests on boilers and stoves, as mentioned before, are for the most part of combined efficiency, and a comparison of a burner in one plant with that in another under different conditions and supervision is not fair. In some cases, opportunities of testing two or more types gave indication of what might be expected, and it is best for those interested to study the data collected and apply it to their own conditions. The indirect boiler test is not to be trusted except in the hands of experienced engineers. Low stack temperatures alone mean very little, without the corresponding flue gas taken at the same point. Erroneous temperatures can be obtained in various ways, principally as follows:

1.—By placing the thermometer or couple too near the tubes or drums.

2.—By not placing the instrument in the gas flow, as in an eddy spot or too near the wall, too near the damper, etc.

3.—By having air leaks around the couple.

4.—Excess infiltration of air in the boiler or stack connections.

A Complex Study

It will be observed, from the information collected, and here presented, that the subject of properly burning gas is of more complex character than at first appears, and this is further borne out by the fact that almost every plant of importance is at present either reviewing data or experimenting with a burner of their own development. A few of the most prominent ones are outlined and descriptions of many others have been received, but without sufficient data to warrant their inclusion. All, however, come within the subdivisions outlined. The data was collected and presented with a two-fold object. First:—To exhibit in a comprehensive manner the present status of stove and boiler burner development, with a general collection of sufficient data and tests, for the guidance of those who wish to pursue the subject to a further extent. Second:—To call attention to the fact of the economic waste prevalent in most of our large installations, due to lack of observation and attention to what was and is in some cases, a minor by-product and a secondary consideration.

The Value of Electric Heat Treatment

BY J. W. RICHARDS

MR. BAILY has opened up a method which has a wide range of possible usefulness. The automatic heat treatment, eliminating the personal factor of the workman, is a great step in advance in the heat treatment of steel. With proper design and heat insulation, electric furnaces of the Baily type should be capable of putting into the articles to be treated 50 per cent of the heating energy of the current. This heating energy is theoretically

Heat Required to Raise Temperature of Steel

Raising to degrees, Cent.	Raising to degrees, Fahr.	Calories per kilogram.	B. T. U. per pound.	Weight heated. Kilograms per kilowatt hour.	Pounds per kilowatt hour.
600	1,112	85.0	153.0	10.1	22.2
700	1,292	111.8	201.4	7.7	16.9
800	1,472	135.8	244.4	6.3	13.9
900	1,652	152.8	275.0	5.6	12.3
1,000	1,832	167.8	302.0	5.1	11.2
1,100	2,012	183.0	329.4	4.7	10.3
1,200	2,192	200.0	360.0	4.3	9.3

635 kilogram calories (2,515 B. T. U.) per horsepower-hour or 860 kilogram calories (3,320 B. T. U.) per kilowatt-hour. Taking the data per kilowatt-hour, 430 calories (1,705 B. T. U.) will raise a considerable amount of steel to the quenching temperature, as may be seen from the heat required to raise steel to different temperatures given in the accompanying table.

A discussion of a paper on "Heat Treating Steel Automatically", read by Thaddeus F. Baily, at the Cleveland meeting of the American Iron and Steel Institute and published elsewhere in this issue of *The Iron Trade Review*.

At places where electric power is expensive, it should be practical to arrange the furnace to burn coal, gas or oil for preliminary heating to within 100 or 200 degrees of the quenching temperature, and then to use the electric heating only for completing the heating and adjusting the final quenching temperature. Such a combined fuel and electric furnace might work cheaper in many localities than an all-electric furnace. In fact, if gas or oil is available, it would seem quite simple to introduce some fuel heating in Mr. Baily's electric furnace itself, and thus reduce the power consumption where current is expensive. There seems no doubt that some such device would improve rolling practice, by always discharging ingots from the furnace at the proper temperature.

Future of New Method

By S. T. Wellman

There is no question but that an electrically heated furnace such as the one which has been described by Mr. Baily is ideal in every respect. The electrical timing and regulation can be worked out without any trouble, and if the cost of the electrical heating is not very much in excess of ordinary coal or gas, it should have a very extensive field. In the heat treatment of steels, especially alloy steels, it is of the greatest importance that the treatment should be exactly alike in every piece of steel. If occasionally a piece goes through without proper treatment, it is, of course, an occasion of weakness in whatever machine it is used, and if failure follows, the damage to the reputation of the maker of the steel cannot be measured in dollars and cents. Any steel maker can make some steel of the highest quality. No steel maker can make it always perfect, but the one that comes the nearest to the 100 per cent mark is the one that gets the best of the trade. What the steel maker wants and needs is apparatus that is fool proof. Mr. Baily's scheme for heat treating, if properly designed and built, should come very near this much desired end.

If this invention of Mr. Baily's could be successfully applied to heating furnaces or soaking pits for hot steel ingots, it would have a wide field to work in. There is room for great improvement over existing practice. The present furnaces have always seemed to me very crude and an immense amount of heat is lost.

A discussion of Thaddeus F. Baily's paper "Heat Treating Steel Automatically", read at the Cleveland meeting of the American Iron and Steel Institute.

Business News of Nation's Capital

Nearly Half a Million Tons of Steel Will Be Required to Carry Out Plans for Enlarging the Navy

Washington, Oct. 26.—The five-year naval program proposed by Secretary of the Navy Daniels and approved by President Wilson calls for approximately 450,000 tons of steel, including armor plates, shapes and bars. This total is an estimate and can be only that until designs are completed for all the craft, and as some of the units, such as battle cruisers and scout cruisers, are new to the United States navy, it will not be possible to give concrete tonnage figures on them until drafts have been completed.

The naval program, as outlined by Secretary Daniels, involving an expenditure estimated at $502,000,000, provide for the following vessels:

Ten dreadnaughts, six battle cruisers, 10 scout cruisers, 50 destroyers, 15 seagoing submarines, 85 coast defense submarines, four gunboats, one hospital ship, two ammunition ships, two fuel oil ships and one repair ship.

The proposed dreadnaughts will be designed along the lines of the CALIFORNIA, save for hull construction, which will be of a nature intended to better withstand torpedo attacks. Such a construction will call for some 100 tons or more additional steel plates than the amount used in the CALIFORNIA.

Armor tonnages for the 10 dreadnaughts has been estimated as follows:

	Tons.
Class A	73,740
Class A-2	4,010
Class B	2,900
Class C (steel)	630
Total	80,280

Costs Are Greater

Because of the greater fluctuations in the prices of plates, shapes and bars, it is not possible to give a fair estimate of the cost of this material. The present condition of the steel market would indicate that prices for these grades would be higher than those paid in the past, but Secretary Daniels has expressed the hope that prices will be lower when proposals are sought. Estimates have been made that advancing prices of steel and wages, together with changed battleship construction, will increase the cost of a superdreadnaught from $15,000,000 to $19,000,000. It has been estimated also that the cost of torpedo boat destroyers for scout duty has risen about 50 per cent. The last destroyers authorized by congress were estimated to cost $925,000, but the navy department thinks they cannot be built for less than $1,360,000 next year. While the new big type of seagoing submarines has been built for slightly more than $1,000,000, the 15 additional ones planned by Secretary Daniels are estimated to cost $1,500,000 each. The coast submarine construction is also more expensive. Prices for the 16 just contracted for averaged $550,000 or less, while the navy's estimates for future construction are fixed at $650,000, an increase of $100,000 each. Mr. Daniels estimates that the cost of a battle cruiser will be $17,500,000, or virtually as much as a superdreadnaught. It is believed that a battle cruiser, because of the greater area to be covered, will require 5 per cent more tonnage or plates, shapes and bars than required for a dreadnaught.

Government Plant Urged

High costs are assigned by Secretary Daniels as one reason for his reneweing his proposals for the erection by the government of an armor plate and a projectile plant. He announced in his speech in Raleigh, N. C., his home city, last week, that the government should erect these plants, and, it seems certain, if the administration feels sufficient public sentiment is back of it, it will tack these proposals on the naval appropriation bill as amendments. Both were killed in the senate by the last congress, when they were placed in that measure. The point of order that the projects involved new legislation was sustained. Mr. Daniels also wants the government to enlarge the ship ways at the Mare Island, Caf., and Philadelphia navy yards, so that dreadnaughts can be built by the government at these yards. At present, the Brooklyn yard is the only one capable of building a dreadnaught.

As it has been approximated that battle cruisers will require 3,500 tons of armor each, six of them would involve 21,000 tons, making a total of 101,280 tons of armor required for the proposed dreadnaughts and battle cruisers.

Tonnages of plates, shapes and bars entering into a ship of the same type as the CALIFORNIA for ten dreadnaughts, are divided as follows:

	Tons.
Medium steel plates	63,000
Special treatment plates	22,000
Medium steel	22,000
High tensile steel	3,700
Medium steel shapes	30,000
Steel bars	2,700
Total	143,400

Estimating the tonnages of plates, shapes and bars for six battle cruisers at 90,342; for 10 scout cruisers at 50,000; for 50 destroyers at 15,000; for 15 sea-going submarines at 6,750; for 85 coast defense submarines at 36,125 for four gunboats at 1,800; for one hospital ship at 3,000; for two fuel oil ships at 3,000; for two ammunition ships at 5,000 and for one repair ship at 1,500, a grand total of 355,817 tons of plates and shapes and bars would be necessary. This, with 101,280 tons of armor plate, makes 457,095 tons.

Using the prices paid for armor for the CALIFORNIA as a basis, the total cost of armor plate for the dreadnaughts and battle cruisers would be $44,648,060. These figures are based on armor plate costs per ton as follows:

A-1	$435
A-2	486
B	466
C	376

It is understood that it would require an expenditure of $300,000 in the case of the Mare Island yard and $100,000 in the case of the Philadelphia yard to enlarge their ways so that dreadnaughts can be built in them. Both yards are said to be planning to submit bids to be opened on Nov. 17 for two battleships.

In his speech at Raleigh, Secretary Daniels reiterated the old statement that there has been no competition in armor plate and added:

"And recently two of the three plants came under a single ownership.

It has been observed, from this remark, that the steel trade will have to go away from home to learn the news. Mr. Daniels, no doubt, made his misstatement in confusing the plants that have been merged with the newly incorporated Midvale Steel & Ordnance Co.

"Utter Misconception"

Washington, Oct. 26.—A brief was filed yesterday with the interstate commerce commission by the Rogers-Brown Iron Co., Lackawanna, N. Y., as an intervenor, in reply to charges

made by the Buffalo-Union Furnace Co. and the Wickwire Steel Co., Buffalo, protesting that the coke rate of $1.05 per ton from Tyler and Sykes, Pa., to the furnace of the Rogers-Brown company is unduly discriminatory against the complainants, which have to pay a rate of $1.85 per ton on coke from Connellsville. The complainants seek to have the Tyler and Sykes rate increased to $1.45.

In its brief, the Rogers-Brown company says the utter misconception of the legal foundation upon which the case was instituted accounts for the unique character of the proceeding. The complainants, it is pointed out, could receive no possible benefit even if rate were increased. Moreover, it is asserted the rate of $1.05 is reasonable and profitable to the carriers and is not discriminatory.

Steel Rate Hearing

Washington, Oct. 26.—Hearing on the Countiss application for authority to establish a rate of 55 cents per ton on steel from the Pittsburgh district to the Pacific coast has been set by the interstate commerce for Nov. 12 before the fourth section board. The status of the case will not be affected by the proposed withdrawal of the Luckenbach Steam Co. from the coast-to-coast trade. This company was among the water lines which have protested against the 55-cent rate being established. Because the canal is closed to traffic and probably will be for six months or longer, it will be necessary for shipments to the coast to be made by all-rail. Shipments could be made by water only part of the way, and transfer of cargoes at canal ports over the Panama railroad would involve greatly increased freight costs.

Naval Awards

Washington, Oct. 26.—Awards made by the navy department for six torpedo boat destroyers and 16 submarines, making 22 vessels, the largest number ever contracted for at one time, were divided as follows:

Destroyers: Cramp & Sons, Philadelphia, two, $845,000 each; Seattle Construction & Drydock Co., Seattle, Wash., one, $885,000; Bath Iron Works, Bath, Me., one, $879,000; navy yard, Mare Island, Cal., one, $762,638; navy yard, Norfolk, Va., one, $706,305.

Submarines: Electric Boat Co., New York, with works at plant of Fore River Ship Building Co., Quincy, Mass., eight, $545,000 each; Lake Torpedo Boat Co., Bridgeport, Conn., three, $545,000 each; three on Lake company's plans at works of California Ship Building Co., Long Beach, Cal., $548,500 each; navy yard, Portsmouth, N. H., one; navy yard, Puget Sound, Wash., one. Both vessels to be built at navy yards in accordance with plans of Electric Boat Co., which offered use of its plans at $1,000 a vessel, provided the company got the contract for at least eight submarines. The company asked $50,000 for the use of the plans.

One contract for a destroyer was given to the Bath Iron Works partly because of its offer to build a vessel guaranteed to exceed the requirements of the navy department in the matter of speed and cruising radius. Plans of the bidder will be used.

Pig Iron Rates Reduced

Washington, Oct. 26.—By a decision handed down last Friday the interstate commerce commission held that rates on pig iron from Virginia furnaces to Baltimore, Philadelphia, New York and Boston group points shall be reduced to the same basis as the rates applying to those cities. The finding was made in a supplemental order, and becomes effective Dec. 1. Shippers filed a supplemental complaint when the railroads, following the original order of June 9, 1914, had reduced rates exclusively to the four cities named.

New rates that will apply as the result of the order of last week are:

To Baltimore and group, $2.25, reduced from $2.45; to Philadelphia and group, $2.75, reduced from $3; to New York and group, $3, reduced from $3.95; to Boston and group, $3.25, reduced from $3.75.

The order prescribes Virginia rates shall be constructed upon the following bases:

To points in New England not in Boston group, rates shall be built by adding to the Boston rate the arbitraries or differentials employed prior to June 9, 1914; to points north of Harrisburg, Pa., on the branch line of the Pennsylvania railroad running through Williamsport, Md., to Sodus Point, Pa., rates differentially adjusted to the Harrisburg rate, so that the excess, if any, which existed prior to June 9, 1914, in the rates to these points over the Harrisburg rate shall be the excess in the rate hereafter to such points; to points on Long Island rates shall take a maximum rate bearing the same relation in cents per gross ton to the rate from Virginia furnaces to New York that the rate from Pittsburgh to the same point or points on Long Island bears to the rate from Pittsburgh to New York; to points lying north of the main line of the Pennsylvania railroad and west of the line of the Pennsylvania from Harrisburg through Williamsport to Sodus Point, and exclusive of these points, if any, not basing on Philadelphia, New York or Baltimore, maximum rates shall be constructed such that, if identical with the rate to any one of the three basing points immediately prior to June 9, 1914, the rate in the future shall be identical with the rate to said basing point.

Evil Tendencies

Will be Overcome, Said Judge Gary in Address at Lafayette College

In connection with the exercises attendant upon the inauguration of John Henry MacCracken as president of Lafayette college, Easton, Pa., chairman Elbert H. Gary, of the United States Steel Corporation and other prominent business and professional men, were the recipients of honorary degrees by that institution. Judge Gary was made a doctor of laws, as also was Cyrus Hall McCormick, of Chicago, president of the International Harvester Co. In his address, Judge Gary said that "the college has a valuable asset in James Gayley, learned, liberal, loyal, lovable". In concluding his address, Judge Gary said:

"Some of the tendencies of the times are vicious and dangerous to society and to civilization. Unchecked they may imperil property and life and even national government. They have received some aid from those who should devote their time and attention to better things. But in this country and probably in other countries, the growth and spread of these obnoxious proclivities will be checked; first, because of the elimination by the representatives of capital, of all grounds for just complaint; secondly, as the result of what is taught by great and worthy colleges and universities and other kindred institutions, and by wise and good men who are persuasive because they advocate what is right and condemn what is wrong; and thirdly, for the reason that the large majority of the people are intelligent and honest and fair and will always, sooner or later, properly settle all questions, however, difficut or imminent".

Will Install Heroult Furnace

The Simonds Mfg. Co., with head office and two factories at Fitchburg, Mass., and also with saw factories at Chicago and Montreal, has signed contracts with the United States Steel

Corporation for license and with the American Bridge Co. for the installing of a 5 to 6-gross ton Heroult three-phase electric melting furnace. The Simonds company procured the first Girod license in the United States and a small 500-kilogram furnace was installed at the then Chicago steel mill for experimental purposes, and when the steel mill of the Simonds company was moved from Chicago to Lockport, N. Y., in 1910, this furnace was moved as part of the regular equipment. In 1914 this small furnace was dismantled and a larger one designed and built by the engineers of the company following very closely the original Siemens type, with one electrode in the hearth and one electrode through the roof.

Wharton Property

Has Been Optioned—Combine of Furnaces is Possible

The plant of the Wharton Steel Co. at Wharton, N. J., consisting of three blast furnaces and various iron ore properties in the immediate vicinity, has been optioned by parties whose identity has not as yet been learned. The Wharton group consists of three furnaces with an annual capacity of about 300,000 tons. The plant was built by the late Joseph Wharton. The No. 2 furnace was finished in 1901 and the No. 3 in 1903. The No. 1 furnace, which is an old one, was remodeled in 1892. These furnaces have not been operated for several years or shortly following the death of Mr. Wharton. The company also controlled the Andover furnace at Andover, N. J., which was sold and dismantled several years ago. The ore mines were operated for some time after the furnaces had been blown out, but are idle at the present time. These properties contain a large body of magnetite ore. The Wharton Steel Co. also is the owner of large tracts of coal land in Pennsylvania and Western Virginia, limestone properties in New Jersey and a short railroad connecting nearby through lines with the mines. The company is controlled by the heirs of the late Joseph Wharton. The fact that an option also has been asked on the property of the Thomas Iron Co. nearby the Wharton Steel Co. has indicated that these two negotiations may be in common and has occasioned a report that a combination of eastern merchants blast furnaces is in view.

R. S. Stocvis & Zohnen, well known Rotterdam, Paris and Brussels machinery house, is to open an office in New York at 17 Battery place.

Shell Orders

Will Go to Some of the Smaller Canadian Plants

Toronto, Oct. 26.—David A. Thomas representing the British minister of munitions, and Sir Frederick Donaldson and Lionel Hichens, two British experts, have held a conference with Premier Borden and General Sir Sam Hughes, minister of militia, respecting the reorganization of the work of manufacturing war munitions in Canada. It is understood that arrangements were made for utilizing many of the smaller factories which have not so far received shell orders, and that in future a fixed schedule of prices will be adopted and that every firm which can give an adequate assurance of being able to fill orders will be given an opportunity to obtain them.

An investigation by J. D. McFarlane, mining engineer, of the zinc deposits near Burbridge, in Gatineau district, about 72 miles from Ottawa, to which attention has recently been directed, has conclusively established their value. He reports that every 750 tons of ore will yield 100 tons of zinc. In one spot, 40 x 25 feet, there is 40 per cent of zinc. The deposits have been known for some years, but owing to difficulty of access and the fact that zinc was not much in demand, no steps for their development have been taken.

An important discovery of molybdenite has been made in Eardley township, about 18 miles from Ottawa. Two well-defined veins varying in width from 6 to 10 inches have been traced for 140 feet. They carry a percentage of molybdenite varying from 3 to 70 on the surface, associated with pyrite calcite quartz and red granite. In view of the demand for molybdenite for armament manufacture, this find is regarded as opportune.

Ore Conditions in Germany

During August, the blast furnaces in Germany were supplied with iron ore more regularly and in larger volume than in preceding months.

The demand for red iron ore, as used for the production of foundry pig iron, is very brisk. The following prices are asked: For 50 per cent red iron ore $4.76 per metric ton f. o. b. mine, for 31 per cent minette $1.13, for raw spar $3.81, for sparry ore $5.71, for brown iron ore $3.81 and for hematite ore $12.

German exports of iron ore in times of peace averaged monthly 83,000 metric tons, while normal imports of iron ore reached 560,000 metric tons per month, of which 32 per cent were imported from Belgium and France, from the other, now hostile countries, 12 per cent, from neutral countries, now cut off from the German market, 25 per cent, and from neutral countries, still in communication with Germany 31 per cent.

These imports, now lacking, are offset by the output of the Belgian mines at Longwyer and by the French iron ore districts which are now in the hands of the Germans.

The German iron ore output reaches at the present time almost 1.3 million metric tons.

Bad Effects

Of La Follette Law Shown to Government Officials

Charles M. Schwab, president of the Bethlehem Steel Corporation, and Eugene B. Thomas, president of the United States Steel Products Co., are among the vice presidents of the American Asiatic Association chosen at the annual meeting at New York, Oct. 21. Alba B. Johnson, president of the Baldwin Locomotive Works, also is a vice president. Willard D. Straight was re-elected president for the ensuing year. Mr. Straight, in his address stated that the general prospect for increasing the business of the United States in the Orient was the most promising of any time in recent years, but that its development was handicapped greatly by the lack of steamships under the American flag. The effect of the LaFollette seaman's law, has been very harmful in forcing the transfer to other flags or the sale of some of the few American boats which have been in operation in that traffic, particularly those of the Pacific Mail and Dollar Steamship companies. Mr. Straight stated that the association had brought the matter urgently to the attention of the government and was waiting for some relief in that direction.

Among recent orders for Thomas spacing tables are a duplicate order of a machine just furnished a couple months ago, from the Bettendorf Co., Bettendorf, Ia., and new orders from the Illinois Car Co., Chicago; the Alliance Structural Co., Alliance, O., and the German-American Car Co., Chicago.

The Bucyrus Co. has opened an office at 900 Hibernian building, Los Angeles, Cal., in charge of G. H. Hutchinson.

Mather Welcomes Institute

(*Continued from Page 852.*)

1870 expanded into the Standard Oil Co., with Cleveland as its headquarters. For a long time it was one of the leading, if not the leading, industry of Cleveland; but today the oil industry ranks sixth in the total value of its products—the iron and steel industry coming first with a total value of manufactured products, according to the 1910 census, of $76,000,000.00, employing over 28,000 men. Next in rank to iron and steel comes the atomobile industry, which, against nothing reported in 1900, showed a value of products in 1910 of $21,400,000. Today Cleveland stands second in the United States in this new and vast industry.

Slaughtering and meat packing is the third industry in importance in Cleveland, and the fourth in order is the manufacture of women's clothing. Berlin and New York only are larger producers of women's outer garments than Cleveland, which has three of the four largest producers of these artistic garments in the world. My immediate auditors may not be particularly or keenly interested in this fact, but I suggest that you store it away in your memory and tell your wives and daughters; and I should like to add this fact, that, in the excellence of buildings and equipment in this industry, Cleveland leads the world.

Very near Cleveland are situated also the Berea and Amherst sandstone quarries, which, I am told, are the largest quarries of that character of building stone in the world.

Has Many Lumber Yards

There are more than 42 extensive lumber yards in this city, over two-thirds of which are along the Cuyahoga river, where admirable facilities exist for unloading shiploads of lumber; and by far the greatest portion of this lumber is worked up in the building trade industry, and the manufacture of furniture, window sashes, automobile bodies, sewing machine cabinets, etc.

The industries of Cleveland, in fact, produce such a large number of different articles that in the commercial world, it has become known as the "city of varied industries". You know there are ten blast furnaces here with an average output of 120,000 tons monthly; that, because of its vast output of nails, spikes, screws, tacks, drills and bolts, Cleveland has been called "The Sheffield of America"; that many kinds of steam hammers, lathes, punches, rolls, drills, shears and forges are built here; that there are large manufactures of copper, tin and sheet iron, and of brass and bronze; that it outranks all other American cities in the production of wire and wire nails, electric carbons, bolts and nuts, dry batteries, sewing machines, malleable castings, heavy machinery and many other articles. In a word, the statistics of 1910 show that Cleveland produces considerably more than 2,000 different kinds of manufactured articles, in 2,148 establishments, engaging approximately 100,000 wage workers, with the manufactured products valued at $272,000,000.

Many Industries

It is impossible to go, in the short space of time allotted me, more minutely into details; but I cannot avoid calling to your attention the fact that the great Lick and Yerkes telescopes were made in Cleveland; that the largest manufacturer of paint in the world is the Sherwin-Williams Co., of Cleveland; and that the pioneer manufacturer of unloading machinery is situated in Cleveland—the Brown Hoisting Machinery Co.; the Hulett ship unloader is also manufactured here.

Seven trunk lines of railroad, many lines of passenger boats, besides freight boats, five electric lines and 130 miles of paved roads leading into the city, constitute our main traffic advantages, to which should be added the Cleveland Short Line railway, a belt line recently completed at a cost of $18,000,000, which makes a circuit of 19 miles around Cleveland, intersecting every railroad entering the city at a point near their yards, without crossing any street railroad lines or thoroughfares at grade. It is said that this is the shortest and most convenient belt line in any American city, with the easiest grades.

The development of Cleveland's outer and inner harbor has also received special attention—about $6,000,000 having been expended by the United States government, chiefly in the construction of the breakwater protecting the outer harbor. The city of Cleveland has expended upwards of $3,500,000 in the improvement and maintenance of the Cuyahoga river, which is now navigable for boats drawing 20 feet of water, for a distance of about four and one-half miles. One million dollars more have been voted for immediate further improvement of river navigation. The total tonnage of all freight received by lake in 1914 was 9,900,000 tons, and the shipments amounted to 9,300,000 tons. The freight received by rail amounted to 20,300,000 tons, and the shipments by rail were 12,000,000 tons. This includes shipments of about 4,000,000 tons of bituminous coal.

An ordinance to be voted upon by the electors on Nov. 2, will, if passed, give the city the ownership of the lake front opposite the center of the city, for a further distance of approximately a mile; and, if this ordinance is approved, undoubtedly, great improvement in the outer dock facilities may be looked for.

Banking facilities are, of course, an important factor in the development of any community, and the establishment of the Federal Reserve Bank of the fourth district at Cleveland is a recognition, in part at least, of Cleveland's sound banking record, and of its industrial and commercial development. The deposits in Cleveland banks on June 15 were $335,000,000, more than one-third the total deposits in all the banks of the state of Ohio.

Cleveland has a temperate climate and has the lowest death rate of any of the ten largest cities of America. It has a new charter, adopted in 1913, which provides for a government based on the federal plan, concentrating authority in the chief executive, the mayor. The increase in population from 1900 to 1910 was 47 per cent. It is estimated that 25 per cent of the population are born of native parents; 10 per cent have one foreign parent; 30 per cent, while native born, have foreign parents, while the remaining 35 per cent are foreign born.

Cleveland also has been in a happy condition in regard to its labor market, having an excellent supply of high grade labor at all times. It is a city of workingmen's homes. The British board of trade, in reporting on working-class rents, housing, etc., in the United States, commented very favorably on workingmen's homes in Cleveland. The census of 1910 showed that over 35 per cent of Cleveland homes were owned by their occupiers.

Schools Rank High

Like most American cities, Cleveland has excellent public schools for the education of its children, including commercial and industrial high schools, with excellent private schools; for higher education we have Western Reserve University, with its eight departments, and Case School of Applied Science. Also a good school of art, and before the year closes will be opened Cleveland Museum of Art, a beautiful marble building in Wade Park. The city is rapidly extending its system of play grounds, and is encouraging the use of its parks. There are more than 2,000 acres of public parks, with 41 miles of connecting boulevards. With the recent adoption of eastern time in Cleveland, which gives us an hour more of daylight after working hours, it is surprising to note the increasing number of people who avail themselves of the opportunity of out-door recreation in the parks.

Iron and Money: Fact and Comment

Regardless of Break in Exchange and Some Other Unfavorable Conditions, Stocks Still Advance

IN SPITE of the break in foreign exchange and some other unfavorable features, the trend of the stock market last week was upward. New York City banks increased loans $52,400,000. An increase of $4,500,000 in excess reserve of clearing house banks was recorded. Europe continues to liquidate stocks and bonds. This policy undoubtedly has some effect in demoralizing the foreign exchange market.

Trading started out at a lively rate Monday, but fell short of a million shares for the day. Steel common rose to 85¾, a five-year record. Bethlehem Steel, American Steel Foundries, American Car & Foundry and most of the war stocks advanced to new high records.

Tuesday Market Active

Another lively start was made Tuesday morning, with Steel common, Bethlehem, Steel Foundries and other industrial stocks leading in the upward movement. Bethlehem reached 500 and Steel went to 87¼. The advance of steel was made in spite of strong opposition from the professionals. Foreign selling of stock was apparent.

War shares were again most prominent Wednesday. It was announced that Russia is about to float a half-billion dollar loan at home and is closing for a credit here between $25,000,000 and $50,000,000, while Italy's $25,000,000 bond issue is being publicly offered on this side.

War and auto stocks made heavy advances Thursday. Steel common registered 87¾; its record of 94⅞ was made in 1909. The weekly statement of the bank of France indicated a gold increase of $49,000,000, showing a collection of the precious metal from private sources in exchange for currency. The bank of England reported a $5,000,000 gold decrease.

Gains in war, automobile and rail stocks were the features of Friday's market. Bonds were strong.

Some new records were made in the two-hour session Saturday, but the influence of the decline in sterling was felt. The rise in United States Steel is generally credited to the fine financial statement which has been anticipated with confidence.

Quotations at the close of business Oct. 23, and changes in the leading stocks identified with the iron and steel industry for the week are shown in the following table:

	Close Oct. 23.	Net chge.
American Can	63¼	—1
American Can, prfd.	106¾	+ ⅝
Amer. Car & Fdy. Co.	90	+5
Amer. Car & Fdy. Co., prfd.	116	— ⅝
American Locomotive	73⅜	+5⅞
American Locomotive, prfd.	99	+ ⅛
American Steel Foundries	71⅜	+6
Baldwin Locomotive	142	+9
Baldwin Locomotive, prfd.	110½	+3¼
Bethlehem Steel	585	+101
Bethlehem Steel, prfd.	184	+20
Colorado Fuel & Iron	58⅜	+3½
Continental Can	105½	—4⅜
Continental Can, prfd.	107	—1½
Crucible Steel	94	+ ½
Crucible Steel, prfd.	109	.....
General Electric	177	—1⅜
International Harv. of N. J.	110	+ ½
International Harv. of N. J., prf.	117	.....
Lackawanna Steel	85¼	+ ⅜
Nat'l Enamel. & Stamp. Co.	33¾	+3¼
Nat'l En. & Stmp. Co., prfd.	91	— ½
Pressed Steel Car	72	+1
Pressed Steel Car, prfd.	105	+1
Pullman Palace Car	166	+1⅜
Republic Iron & Steel	54⅜	+1⅜
Republic Iron & Steel, prfd.	104	.....
U. S. Cast Iron Pipe & Fdy.	27	+2½
U. S. C. I. P. & Fdy., prfd.	47½	+1
United States Steel	86½	+3⅞
United States Steel, prfd.	115	+ ½
Westinghouse Mfg.	72⅜	+3

Financial Notes

The Nova Scotia Car Works, Ltd., of Halifax, has gone into voluntary liquidation, being unable to effect a compromise at 50 cents on the dollar with its creditors, or to secure financial assistance from the city.

The report of the Russell Motor Car Co., Ltd., of Toronto, to be submitted to the annual meeting of shareholders on Oct. 29, covering two years ending July 31, 1915, shows a loss of $703,364, including provision for repair of plant, depreciation, etc. The manufacturing program was found too expensive for existing trade conditions. A conservative policy has been adopted for the coming year and a lighter, smaller car than any yet produced will be put on the market. It was deemed advisable to sell the company's business in Australia.

May Reopen Plant

A dispatch from Wilmington, Del., states that a notice has been posted at the entrance of the Old Ferry mill of the Diamond State Steel Co., calling for laborers and this has given rise to the belief that the re-opening of the plant is a possibility of the near future. The property of the Diamond State Steel Co. is owned by David Driscoll, of Reading, Pa., who bought it a year or more ago at receivers' sale. It has been idle for about 11 years. The steel works consists of five 50-ton open hearth furnaces, four of which are basic and one acid. The rolling equipment comprises a 34-inch blooming mill and 11 trains of rolls, including three 9, two 10, one 14, one 16 and four 18-inch. There also are puddling and heating furnaces. When it was operated, the works produced merchant bars, horseshoes and horseshoe iron, various classes of spikes, nuts and bolts and track fastenings.

Making Machine Guns

Within a month the Maxim Munitions Co., New Haven, Conn., expects to be doing a large business and turning out 500 machine guns every 30 days. The company will be unique, in that it will not manufacture the guns on the premises, but will have the parts made in numerous machine shops throughout the United States and will confine the activities of the New Haven company largely to assembling these parts. The active heads of the company are Capt. E. R. Beckert, who is well known as an organizer, and Robert Sweeney, reported part owner of the Coeur d'Alene mines in Montana. Hudson Maxim, from whom the company takes its name, will be only nominally interested in the conduct of the business. The company has advertised as far west as Chicago for assemblers.

Name is Exclusive

The advent of the convertible car has developed an interesting situation. Kissel brought it out last year and applied a name and gave it wide newspaper publicity. The public responded and this year other manufacturers began to make detachable tops. Then the trade name which Kissel originated, "The All-Year Car," began to creep into the advertising of other manufacturers. At this juncture Kissel stepped in and said "stop"!

"We expected competitors to follow us on the all-year car, as they did on the divided front seat and the two-door body," says George A. Kissel, president of the Kissel Motor Car Co., "but we must object to the use of our trade name."

Tool Makers Turn to Home Markets

Domestic Business Grows Better as War Orders Decline—Rolling Mills Buy Equipment—Labor Disputes Fail to Close Shops

THE machine tool market now appears to have passed the period of intense activity which prevailed from the fall of 1914 until a few weeks ago. An explanation of this may be found in the fact that most dealers and manufacturers are so well sold up on all kinds of machine tools suitable for munition makers that they are unable to offer satisfactory deliveries on tools in demand. While there still remains a large volume of business in the equipment market, it is of a more or less scattered character, and large orders are by no means so general. The largest demand in the field now comes from Italy and Spain, the former government buying actively for the past 30 days, while the latter has put out several fairly large inquiries. England, France and Russia continue to buy tools where reasonable deliveries are granted.

Among concerns which have been awarded contracts for munitions is the American Steel Foundries Co., which has taken an order involving, it is reported, about $30,000,000 worth of 8-inch shells. The shells will be forged by the Steel Foundries, while the Westinghouse Electric & Mfg. Co. will finish them. The Westinghouse Co. is reported to have been awarded a large contract for rifles.

As previously noted, the domestic demand continues to increase. No spectacular transactions, however, have been noted, but there is an increasing tendency to purchase tools in small lots or even singly. Railroad buying has been considerably less active, but indications are that lists of larger proportions will be issued shortly.

Labor Disputes Handicap Dealers

The strike wave which has interfered so seriously with the operations at a number of plants in New England, and which of late has spread in alarming proportions to various points in the middle west, continues to complicate the question of deliveries. Many concerns are at this time several weeks behind on contracts and in a few cases deliveries have been delayed over 60 days.

The Fore River Ship Building Corporation and the William Cramp & Son Ship & Engine Building Co. have each purchased considerable equipment for their plants. The following concerns are planning extensions: The Wilson & Sinclair Mfg. Co., Worcester, Mass.; the Brown Bag Filling Machine Co., Fitchburg, Mass.; the Rochester Stamping Co., Rochester, N. Y.; the H. H. Franklin Mfg. Co., automobile manufacturer, Syracuse, N. Y.; the E. W. Bliss Co., Brooklyn, N. Y.; the Waclark Wire Co., Bayway, N. J.; the Eastern Tool & Mfg. Co., Bloomfield, N. J.; the Driver-Harris Wire Co., Harrison, N. J.; the Lake Torpedo Boat Co., Bridgeport, Ct.; the Clark Razor Blade Co., Newark, N. J.; the Secor Mfg. Co., Derby, Ct.; the Meriden Fire Arms plant of the New England Westinghouse Co., Meriden, Ct.; the New London Ship & Engine Co., Groton, Ct.; the Northern Brass Co., Whitinsville, Mass.; Clayton Bros., Bristol, Ct., the Corliss Steam Engine Works, Providence, R. I.

The eastern crane market is quiet. Conditions in the middle west are more favorable, however, and the following contracts have been awarded: The Cleveland Crane & Engineering Co. has taken one 10-ton crane for the Pennsylvania Steel Co., one 30-ton crane for the Bethlehem Steel Co., and one bucket-handling crane for the Columbia Mills Co., Minetto, N. Y. The Morgan Engineering Co. has taken one 10-ton crane with magnet attachments for the Broken Hill Proprietaries Co., Ltd., New South Wales.

Chicago Dealers Busy

Continued activity marks the machine tool market in the Chicago district. Dealers find that the general tone of domestic inquiry is improving and while not all have had this experience, it is generally agreed that some inquiry is being received which is not due to foreign conditions. The Chicago & North-Western railway has put out a small list of tools, including bolt cutters, bolt headers, two 24-inch lathes and a 25-inch drill. The Inland Steel Co. is inquiring for some equipment for its machine shop. The Illinois Central has bought a few tools for its various shops and will be forced to take a deferred delivery. The Chalmers Motor Co. has issued a list calling for 42 pieces, but with three or four exceptions all are small equipment and probably a number of these can be picked up, as second-hand articles in good condition will be accepted.

Labor troubles in other districts have interfered with deliveries of machines on order from those cities and probably the entire output from manufacturers will be delayed about one month, as reports now are that the strikes will be over in about another week.

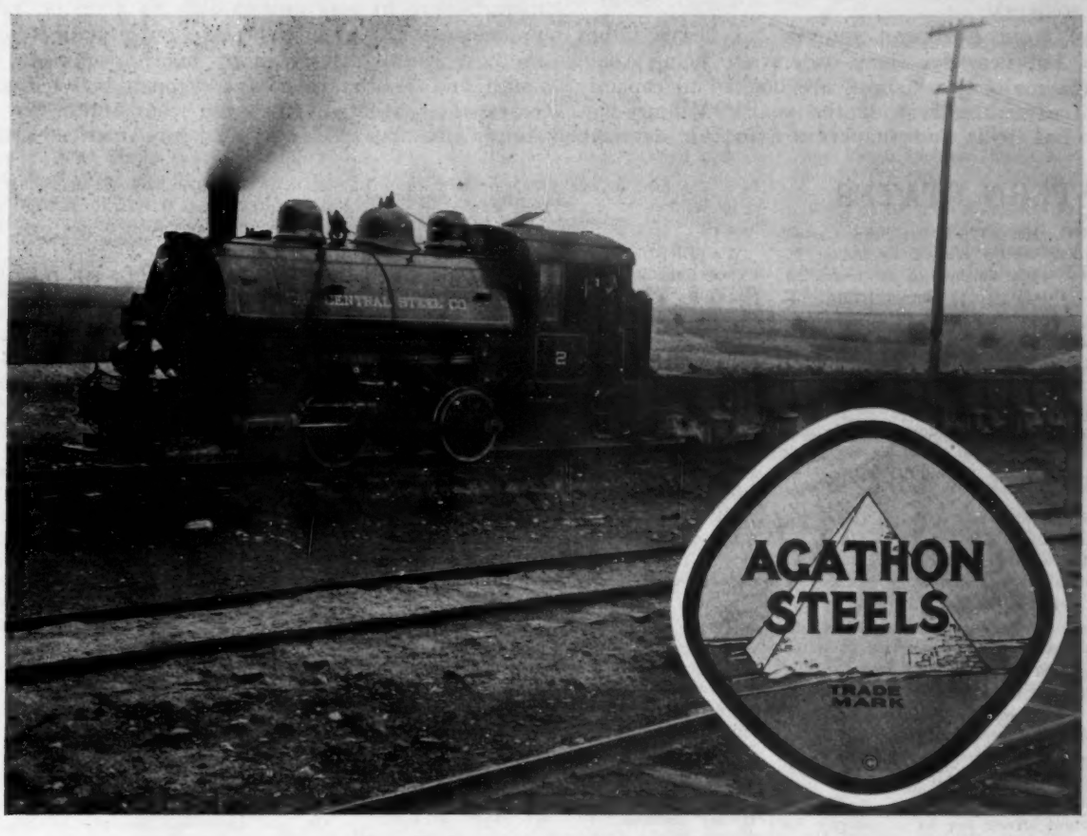
The Rumely-Wachs Machinery Co., 121 North Jefferson street, recently bought the entire machine shop equipment of the John Thompson's Sons Co., at Beloit, Wis., which included 47 tools, all of the varieties now most in demand. Practically half these are already sold and shipped, all the lathes, screw and milling machines being disposed of and some of the remaining machines under negotiation. Other plants out of commission are being dismantled and the supply of second-hand machines from this source is assisting considerably in meeting the demand.

Domestic Demand Takes Lead

Domestic demand for machine tools and rolling mill equipment is increasing in volume. Crane builders, all of whom took important contracts during the last 60 days, cannot promise deliveries until next year and most machine tool dealers have withdrawn from the market until January or February. The Carnegie Steel Co. and the Jones & Laughlin Steel Co., both of Pittsburgh, have been prominent factors in the market and the Youngstown Sheet & Tube Co., the Brier Hill Steel Co. and the Youngstown Iron & Steel Co. are purchasing equipment for additions and extensions to their plants in the Youngstown district.

Cincinnati Plants Operate Despite Strike

Machine tool makers in Cincinnati are experiencing some difficulty in filling orders because of the present machinists' strike in that city, but none of the 26 plants affected by walk-outs of employes have shut



Locomotive handling train of Charging Boxes

EFFICIENCY IN DISPATCH

The manufacture of steel of highest quality requires the co-ordination of all departments of the plant. The co-ordination cannot be obtained without adequate inter-departmental transportation facilities.

At the works of the Central Steel Company, a carefully laid out standard gauge plant railroad has been provided to handle materials within the plant and to take care of the prompt shipment of finished products over connecting trunk line railways.

This plant railroad is equipped with powerful, efficient switching locomotives.

AGATHON STEELS

WILL SERVE YOUR PURPOSES *BEST!*

WE MAKE

"AGATHON" Chrome Nickel
"AGATHON" Chrome Vanadium
"AGATHON" Nickel Steels
"AGATHON" Special Analyses
"AGATHON" Vanadium
"AGATHON" Silico-Manganese
"AGATHON" Chrome Steel
"AGATHON" High Carbon

THE CENTRAL STEEL COMPANY

MASSILLON, OHIO

Detroit Office: 326-27-28 Ford Bldg. F. Walter Guibert, District Representative
Cleveland Office: Hickox Bldg. The Hamill-Hickox Co., District Representative

down. In several cases machinists have refused to strike, and in various shops a number of the men called out by the machinists' union have voluntarily returned to work.

Demand from European sources for heavy lathes continues, but very few new orders are being taken because the majority of shops are booked to capacity until well after the first of the year. Milling machines, radial drills and shapers are in fair demand. Makers of agricultural machinery expect heavy inquiries after the war, as England, France, Russia and Germany have been using all available shops for the manufacture of war munitions. As a result, farming implements are becoming more or less of a scarcity in these countries. Sales of sugar machinery in the south and South America are much better than last year. The lack of European competition in South America has opened a new field for American products.

EASTERN STATES

PORTLAND, ME.—Work has been started on the building to be erected by Adam P. Leighton, and when finished to be leased to the National Biscuit Co. The structure will be erected on Kennebec street.

ATTLEBORO, MASS.—Crown Mfg. Co. has started work on a 2-story factory building to cost about $35,000.

FITCHBURG, MASS.—The Brown Engine Co. will erect a storage building at Main and Willow streets. Plans call for a 1-story brick and concrete structure having 25,000 feet of floor space.

NORTON, MASS.—The Defiance Mfg. Co. will build a 2-story 60 x 160-foot addition to its mill in Barrowsville. The structure will be of brick and mill construction.

WHITINSVILLE, MASS. — The Whitin Machine Co. is building a 50 x 500-foot addition to its foundry, the steel frame of which has been standing several years.

WHITINSVILLE, MASS. — The Northern Brass Co. has been incorporated; $15,000 capital stock; by Setrak K. Boyajian, Worcester, Mass., and others. A site has been purchased and a foundry will be erected.

WORCESTER, MASS.—Wilson & Sinclair Mfg. Co., Hunt street, has let a contract for the construction of a 2-story, 41 x 50-foot punch factory addition.

BRIDGEPORT, CT. — Lake Torpedo Boat Co. has begun work on the erection of a 1-story, 90 x 240-foot factory addition.

BRIDGEPORT, CT.—The Eastern Brass & Ingot Co. has been incorporated; $300,000 capital stock; by John H. Stearns, Ernest Munster and Albert Ziesk, all of Chicago, Ill.

BRISTOL, CT. — Clayton Bros., Inc., manufacturers of shears, have leased the factory of L. H. Snyder & Co.

DERBY, CT.—The Secor Mfg. Co., builder of tools, has bought the buildings and equipment of the Derby Comb Co. and will increase its output of tools.

DERBY, CT.—The General Ordnance Co. recently incorporated in Delaware with capital of $500,000, by interests identified with the Submarine Boat Co. has purchased the plant of the Rapid Fire Gun Co., of Derby.

GROTON, CT. — A contract has been awarded for the erection of a 100 x 200-foot addition to the plant of the new London Ship & Engine Co. This structure will be brick, steel and concrete and will cost about $50,000.

MERIDEN, CT.—The New England Westinghouse Co., which recently bought the plant of the Meriden Fire Arms Co., will commence work shortly on two 1-story brick factory buildings, 80 x 200 and 80 x 100-feet, respectively. These buildings, it is understood, will be used for the manufacture of gun stocks.

NEW HAVEN, CT.—The National Folding Box & Paper Co. will build a 4-story 105 x 345-foot addition to cost about $100,000. This addition will contain the machine shops and stock rooms.

NEW HAVEN, CT. — Winchester Repeating Arms Co. has let contracts for a 6-story and basement gun factory and storage building, 60 x 153 feet, with two ells, each 54 x 234 feet, to cost $450,000; also for a 5-story building 57 x 257 feet, with a 57 x 269-foot ell.

WATERBURY, CT. — The Waterbury Farrel Foundry & Machine Co. has prepared plans for a 2-story brick and steel addition, 75 x 150 feet, on which work will be commenced soon. Two traveling cranes will be installed.

PROVIDENCE, R. I.—Corliss Steam Engine Works is preparing plans for the enlargement of its plant.

PROVIDENCE, R. I.—The Rhode Island Malleable Iron Works will build a 1-story brick and frame addition to its core building at Hillsgrove.

BROOKLYN, N. Y.—Plans have been filed by the E. W. Bliss Co., for an extension of its machine shop, 200 x 320 feet.

NEW YORK.—It is reported that the American Steel Foundries has secured a contract which involves 8-inch shells having a value of about $18,000,000 to $19,000,000. The shells will be turned out by the Steel Foundries company, and it is understood, will be finished by the Westinghouse Electric & Mfg. Co.

ROCHESTER, N. Y.—Rochester Stamping Co. has let a contract for a 1-story, 60 x 151-foot factory building.

ROCHESTER, N. Y.—Eastman Kodak Co. has let contracts for a 5-story, 83 x 165-foot, a 2-story, 43 x 240-foot and a 1-story factory building.

ROCHESTER, N. Y.—C. W. Eldridge, architect, 316 Cutler building, is preparing plans for a 4-story factory addition, 63 x 64 feet, to be erected in Danville, N. Y. The owner's name is withheld.

SYRACUSE, N. Y.—H. H. Franklin Mfg. Co., manufacturer of automobiles, has let a contract for a 6-story, 107 x 265-foot factory building.

TROY, N. Y.—The Cluett Peabody & Co., Inc., has announced that the company will erect an 8-story 75 x 100-foot building. It is reported that this building is but a part of an extensive building program which is expected to amount to $1,500,000 to $2,000,000.

FRANKLIN, PA.—The Franklin Foundry Co., $25,000 capital stock, will build a plant for the manufacture of steel castings.

MONACA, PA.—Pittsburgh Tool Steel Wire Co. will erect additions to its plant at Monaca to increase the capacity for the manufacture of cold drawn tool steel, etc.

MONONGAHELA, PA. — Through Robert H. Robinson and others of this city and the Pittsburgh industrial development commission, a chemical company will locate here. A site has been purchased and plans will be prepared

NEW CASTLE, PA.—Federal Radiator Co., which is preparing to occupy the works of the Penn Motor Car Co., has taken additional ground for improvements.

PHILADELPHIA. — The Clement-Restein Co. has let a contract for the erection of a 1-story factory building, 60 x 225 feet at Butler and Sepviva streets.

PITTSBURGH. — The finance committee and property and supplies committee of the board of education have recommended that the William J. Payne Jr. Co. be awarded the contract for the foundation of the new Westinghouse high school.

BAYWAY, N. J.—Waclark Wire Co. contemplates the erection of a new factory to cost approximately $75,000.

BLOOMFIELD, N. J.—Eastern Tool & Mfg. Co. has plans under contemplation for building a new tool factory at Grove street and the Erie railroad here. Alfred G. Anderson is president and Carl E. Peterson, 74 Richmond street, Newark, is manager.

DOVER, N. J.—Bids will be received shortly by the board of education for the erection of a school to cost about $220,000.

ELIZABETH, N. J.—The American Gas Accumulator Co., Chestnut and Sixteenth streets, Philadelphia, has purchased six acres in Newark avenue, Elizabeth, and will erect factory buildings. It is said the company will make shrapnel time fuses. Work on three of the factory buildings already has been started.

HARRISON, N. J.—Driver-Harris Wire Co. has let a contract for a new brass foundry.

LAMBERTVILLE, N. J.—The Lambertville Rubber Co. will erect an addition to its plant.

NEWARK, N. J.—The Clark Razor Blade Co. has purchased the site at 205-211 New Jersey railroad avenue and will erect an 8-story factory to cost about $50,000.

NEWARK, N. J.—The Wilkinson-Gaddis Co. is having plans prepared for the erection of a 10-story building at Broad and Lafayette streets.

PATERSON, N. J.—Plans are being prepared for a warehouse for Miller Van Dyke, whose elevator was recently damaged by a fire.

PLAINFIELD, N. J.—Vitaphone Co. shortly will begin work at Netherwood, on a new brass foundry.

BALTIMORE, MD.—The plant of the Pfeil Mfg. Co., 55 Robert street, was damaged by a $5,000 fire. William Pfeil, owner, states that the plant will be rebuilt at once.

WASHINGTON, D. C.—The Washington Steel & Ordnance Co., Giesboro park, has had plans prepared and expects to start work immediately, on a 126 x 165-foot 1-story forge building to cost about $21,000.

CENTRAL STATES

ASHTABULA, O.—The city of Ashtabula has joined Cleveland in bidding upon the proposed armor plate plant suggested as a part of the national defense program of the United States government. It is reported that the city of Lorain, O., will also make proposals.

CANTON, O.—Thomas H. Leahy, attorney, announces that Frederick Grant, Cleveland, of the Universal Mfg. Co., Cleveland, has taken a 60-day option on the plant of the Great National Products Co., High avenue, and plans a $200,000 organization for the manufacture of toys and small auto specialties. It is the intention of the company to fill the markets left vacant by German concerns whose specialty has been toys.

CINCINNATI, O.—The Advance Battery Mfg. Co. has been incorporated; capital stock,

$10,000; by C. B. McCree, G. L. Buhrmann, and C. E. Ogden.

CINCINNATI, O.—The new addition to the plant of the Joseph Joseph & Bros. Co., iron and steel scrap dealers, will be completed about Jan. 15, at which time the offices of the company, temporarily located in the First National Bank building, will be moved to the plant on Harrison avenue.

CINCINNATI, O.—A firm of industrial engineers has been formed consisting of H. M. Ramp, C. T. Hughes, and E. M. Chase. Mr. Chase was superintendent of the Cincinnati Shaper Co., and recently has been employed by the Cincinnati Milling Machine Co. The other two members of the firm have been industrial engineers for several years.

CLEVELAND,—A contract for the construction of a 5-story, 128 x 165-foot warehouse and supply depot, previously noted, to be erected for the W. M. Pattison Supply Co., 215 St. Clair avenue, Cleveland, has been awarded to the Hunkin Conkey Construction Co., 320 Cuyahoga building.

LIMA, O.—The Lima Brick & Tile Co., Taft avenue, has increased its capital stock from $30,000 to $50,000. It is reported that the plant will be enlarged. Alpheus McPheron and Byron Langan are the owners.

MASSILLON, O.—The Central Steel Co., John C. Neale president, will erect a merchant mill at its plant on Columbia Heights to increase the output of small iron bars.

STEUBENVILLE, O.—The American Gas & Electric Co., having a plant at Wheeling, will build a branch plant on the river near Rush run, and will supply the city of Steubenville with power. The plant will have a capacity of 100,000 kilowatts and will supply the mines in this vicinity.

TOLEDO, O.—The Toledo Electric Welder Co. has increased its capital stock from $75,000 to $150,000.

TOELDO, O.—The Standard Electric Stove Co. has increased its capital stock from $100,000 to $300,000.

WOOSTER, O.—The Wooster Electric Co. has increased its capital stock from $50,000 to $125,000. A number of improvements are contemplated.

YOUNGSTOWN, O.—The Republic Rubber Co. will increase the capacity of its plant for the manufacture of tires.

YOUNGSTOWN, O.—The Youngstown Car Co. has sent plans for new steel buildings to prospective bidders. The company will manufacture and repair industrial cars.

CHARLESTON, W. VA. — The American Vacuum Can Co. plans to build a plant near Charleston for the manufacture of vacuum milk cans and other metal containers. Machinery to make 100,000 cans a day will be installed in a building, 150 x 200 feet.

HINTON, W. VA.—The Virginia-Western Power Co., Clifton, Va., is understood to be considering the erection of an additional steam power plant at Hinton.

HUNTINGTON, W. VA. — The Wright Motor Car Co., which plans to erect a new garage, will need additional equipment for a repair shop.

HUNTINGTON, W. VA.—The Huntington Plate Glass Co. has been incorporated to manufacture glass products; $50,000 capital stock; by G. J. Michaelson, C. W. Kendee, F. C. Fowler, M. J. Whalen and Henry Rudig, all of Huntington.

HUNTINGTON, W. VA.—The Huntington-Chesapeake Bridge Co., capital stock $5,000; incorporated by J. C. Miller, R. P. Aleshire, Herbert Fitzpatrick, Paul Hardy, Frank Enslow Jr., and Thomas W. Harvey, all of Huntington.

ARTEMUS, KY.—The Jackson Coal Mining Co. has been organized with $30,000 capital stock and will equip a plant at once. D. H. Jenkins, Knoxville, Tenn., may be addressed.

CLOVERPORT, KY.—The Cloverport Boat & Mfg. Co., P. W. Pate, manager, will build a plant consisting of a 30 x 140-foot building with two wings each 30 x 30 feet, and will conduct a foundry and machine shop. Engines, machine tools and other equipment will be purchased.

DANVILLE, KY.—The Danville Light & Power Co. is reported to have had plans prepared for an extension of its line to Lancaster, Ky.

LEXINGTON, KY.—The Phelps-Post-Guyn Co. will purchase a rock crusher with power equipment and is also in the market for a traction engine, road roller and other road equipment.

LOUISVILLE, KY. — The Louisville & Nashville railroad, with general offices in Louisville, will enlarge the capacity of its car repair shops at Howell, Ind.

LOUISVILLE, KY.—The L. W. Hancock Co. has been awarded a contract for the erection of a 6-story reinforced concrete warehouse for the Speed Realty Co. The estimated cost of construction is about $60,000.

OWENSBORO, KY.—The Hull Pump & Tank Co. has been incorporated to manufacture sheet metal products and other goods; $100,000 capital stock; by N. D. Hull, J. J. Trefz, formerly of the International Harvester Co., Springfield, O., and J. W. McCulloch.

BROOK, IND.—The Brook Utilities Co. has been authorized by the state public service commission to issue bonds for a water works system.

BROOKVILLE, IND.—Board of town trustees has sold $20,000 worth of water works bonds to pay for constructing a system.

EVANSVILLE, IND.—The Illinois Central railroad is planning a new freight station at Evansville to cost $50,000. A. S. Baldwin, chief engineer, Chicago.

INDIANAPOLIS, IND. — The Indianapolis Structural Iron Works has been incorporated; $50,000 capital stock; by Charles T. Blizzard, Charles E. Owen and A. C. Waterman.

INDIANAPOLIS, IND. — The American Steel Products Co. has been incorporated; to manufacture mechanical and electrical appliances; $25,000 capital stock; by L. H. Oberreich, H. E. Oberreich and Joseph A. Martz.

INDIANAPOLIS, IND. — Plans are being prepared for a train shed to accommodate the track elevation at the Union station of steel and reinforced concrete. P. J. Landers, care of the Indianapolis Union railroad, is the engineer.

MOROCCO, IND.—The state public service commission has issued a permit for the city of Morocco to issue bonds for water works construction.

WACKARUSA, IND. — The Wackarusa Water Co. has been granted permission by the public service commission to issue $20,000 in bonds for construction of a water works system.

BEARDSTOWN, ILL.—Plans have been prepared for Schultz-Baujan & Co. for a 6-story, 35 x 100-foot mill. The estimated cost of construction is $50,000.

CHICAGO.—The Chicago Steel Foundry Co. will build a foundry 100 x 100 feet, costing $20,000.

CHICAGO.—The National Safety Device & Mfg. Co. has been incorporated; $25,000 capital stock; by John E. Erickson, Joel C. Carlson and L. L. Cowan, 10 South La Salle street.

CHICAGO.—The Stromberg Motor Co., East Twenty-fifth street, is obtaining estimates on a 6-story factory, 60 x 110 feet, to cost about $100,000.

CHICAGO.—The Steel Fabricating Co. has been incorporated; $50,000 capital stock; by Paul Phipps, August Drout and Charles H. Aldrich, 137 South La Salle street.

CHICAGO.—The Cadillac Automobile Co., C. H. Foster, president, 2301 South Michigan avenue, is planning to erect an 8-story service building, 100 x 160 feet, costing $200,000.

CHICAGO. — The Illinois Machinery Co. has been incorporated; $5,000 capital stock; by Lazarus Brinski, John L. Anderson, and Egbert Robertson, 38 South Dearborn street.

CHICAGO. — The Lacy Machine Co. has been incorporated; $10,000 capital stock; by Franklin H. Lacy, Frank W. Kee and Paul Corkell, 105 West Monroe street.

CHICAGO.—L. G. Hallberg, 19 South La Salle street, architect, is preparing plans for a factory building, six stories, for the Stewart Warner Speedometer Corporation, at Wolfram street and Lincoln avenue.

BATTLE CREEK, MICH. — Metcalf Generator Co. has been organized by O. K. Cummings, and C. H. Scully to establish a plant for the manufacture of gas generators.

DETROIT.—Statler hotel will build an addition at Washington boulevard.

DETROIT.—The Parrish Mfg. Co., builder of automobile frames, is to build an addition to its plant on Mt. Elliott street to cost $2,000.

DETROIT.—The Medallion Register Co. has been incorporated to manufacture numbering devices; $25,000 capital stock; by Carl H. Pelton, Leo M. Butzel and Seth H. Heft.

FLINT, MICH.—The Chevrolet Motor Co. of Delaware, a newly incorporated concern, will build an assembling plant at Flint.

HOWELL, MICH.—The Howell General Motors Co. has been incorporated; $30,000 capital stock; by H. M. Spencer, Howell, and Carl L. Dann, Saginaw, Mich. A site has been purchased and a plant will be erected.

JACKSON, MICH.—The Hayes Wheel Co. is increasing its capital stock from $300,000 to $1,000,000 and will buy plants at St. Johns, Mich., and Anderson, Ind.

KALAMAZOO, MICH.—The D'Arcy Spring Co. is in the market for shears, punch presses and wire working machinery.

LANSING, MICH.—Bids will be received until Nov. 15, S. D. Butterworth, architect, 432 Tussing building, on an 8-story bank building, 45 x 100 feet, for the Lansing State & Savings Bank.

MENOMINEE, MICH.—A special election has been called for Nov. 1, to vote on the issuance of $285,000 in bonds to be used for the purchase of the present privately-owned waterworks plant and system for $200,000 and $85,000 to be expended for improvements and extensions. If the private company refuses to sell, the entire $285,000 will be spent in the construction of a new plant and system.

MUSKEGON, MICH.—The Lake Foundry Co. is to enlarge its plant.

SAGINAW, MICH.—A special election will be held Dec. 3 on issuing $750,000 in bonds for a consolidated water works plant.

FORT ATKINSON, WIS.—The Lake Side Bridge & Iron Co., North Milwaukee, Wis., has

been awarded the contract for furnishing and erecting the steel for the $75,000 postoffice building at Fort Atkinson. The general contractor is the Clark Construction Co., Danville, Ill. C. Colnik Co., Milwaukee, will furnish the ornamental and architectural iron work.

GREEN BAY, WIS. — The Western Steel & Iron Works is building an addition costing about $10,000.

HARTFORD, WIS.—Plans for the shop and factory of the Hartford Auto Tire Pump Co., to be built by L. J. Knickerbocker, are being revised to provide for a second story. The building will be two stories, with basement, 55 x 80 feet, of reinforced concrete and hollow tile construction. Val. A. Siebert & Co., Milwaukee, are preparing plans.

MANITOWOC, WIS.—Edwin J. Juul, architect, Sheboygan, Wis., is preparing plans for a modern garage and machine shop for William A. Hagan & Sons at Manitowoc. It will be brick and steel, 50 x 115 feet.

MILWAUKEE. — The Flach-Schneeberg Co. has been organized at Milwaukee by Henry W. Flach, Fred Schneeberg and Guido R. Ulbricht to manufacture and market automobile parts and accessories. The corporation has a capital of $5,000.

MILWAUKEE.—The Wehr Steel Co., Forty-fifth avenue and Gordon place, West Allis, has broken ground for a brick and steel foundry addition, 90 x 80 feet. The general contract has been awarded to the Northwestern Bridge & Iron Co., 172 South Water street, Milwaukee.

MILWAUKEE.—The Auto Parts Mfg. Co., which moved to larger quarters at 528-532 Broadway, has increased its capital stock from $15,000 to $35,000 to accommodate an enlarged production and activities. Burton L. Hibbard is president and James D. Miller is secretary and manager. The concern manufactures shock absorbers, bumpers, wind shields, etc.

MILWAUKEE. — All contracts have been awarded by Herbst & Hufschmidt, architects, 721 Caswell block, for the machine shop and factory of the Milwaukee Auto Engine & Supply Co., 708 Winnebago street, at Meinecke avenue and Twenty-ninth streets, to cost approximately $15,000. The building will be of concrete, steel and brick construction, 1 and 2-story, 60 x 120 feet.

NEENAH, WIS.—The C. R. Meyer & Sons Co., Oshkosh, Wis., general contractor on the $75,000 Merchants and Manufacturers' hotel at Neenah, has sub-let the structural steel and ornamental iron work, including metal doors, to the A. F. Wagner Architectural Iron Co., Milwaukee, Wis.

OSHKOSH, WIS.—The common council has engaged H. A. Allen, consulting engineer, Chicago, to prepare plans for a filtration plant for the municipal waterworks system. The filter will have a capacity of 6,000,000 gallons daily.

RACINE, WIS. — The Wallis Tractor Co., Cleveland, organized a year ago by Racine capital actively identified with J. I. Case Plow Co., Racine, and headed by H. M. Wallis Jr., will move its plant and offices to Racine. The company has leased a part of the former Racine plant of the Racine-Sattley Co. at Racine Junction and will equip it for the production of gasoline engines and tractors.

SHEBOYGAN, WIS.—The C. Reiss Coal Co., Sheboygan, Wis., is planning to rebuild the coal unloading towers at its Waukegan (Ill.), docks, damaged by fire recently. The towers were of frame construction, but the replacement will probably be steel construction.

WAUKESHA, WIS. — A heat treating department and a testing room will be provided for the Waukesha Motor Co., automobile and motor truck engines, when additions are completed. The buildings consist of a power and heating plant, 44 x 68 feet, and an assembling and warehouse building, 88 x 220 feet. The space vacated by the power plant and assembling floor will be remodeled for heat treating and final testing departments.

CAPE GIRARDEAU, MO. — The Federal court has decided that a $75,000 bond issue for a municipal water works system is legal and work can be started.

KANSAS CITY, MO. — The McWhirter-Ellison Mfg. Co. has increased its capital stock from $10,000 to $15,000.

POPLAR BLUFF, MO.—Bids will be received until Nov. 3, by H. H. Wilcox, city clerk, for a municipal electric light plant. An issue of $75,000 in bonds has been sold. Fuller-Coult Co., St. Louis, is the engineer.

POWERSITE, MO.— The Ozark Power & Water Co. is about to buy $25,000 worth of additional equipment.

STEELVILLE, MO.—The Steelville Electric Light & Power Co. has asked permission from the public service commission to build an electric light plant to cost $10,000.

ST. LOUIS.—The McQuay-Norris Mfg. Co., manufacturer of piston rings, has increased its capital stock from $100,000 to $200,000.

ST. LOUIS—The Gella Mfg. Co. has been incorporated to manufacture surgical supplies; $42,500 capital stock; by J. B. Black and H. J. Harms.

WASHINGTON, MO.—Bonds for $60,000 have been voted for a water works system. P. H. Peltz, is mayor.

DES MOINES, IA.—City council has ordered F. N. Carrs, city engineer, to prepare plans for a bridge at North street.

DES MOINES, IA.—The New Monarch Machine & Stamping Co. is building a factory one and two stories, 115 x 200 feet, to cost $200,000.

FAIRBANK, IA.—An election will be held Nov. 1 on issuing bonds to build a municipal light plant.

FORT DODGE, IA.—Burns & McConnell, engineers, Kansas City, Mo., are preparing plans for a dam in Des Moines river for a hydro-electric plant for Fort Dodge.

MUSCATINE, IA.—The Co-operative Construction Co. has been incorporated; $10,000 capital stock; by Joseph Dale, Fred Klebe, Charles W. Dale, Lee N. Rainbow and J. W. Rehmel.

WATERLOO, IA.—Waterloo Overland Co. is taking bids on a 4-story factory, 116 x 120 feet, to cost $100,000.

HOPKINS, MINN. — American Improved Seat Co., A. C. Webber, president, will erect a factory.

MINNEAPOLIS.—The Minneapolis General Electric Co. is building an addition to house a 15,000-kilowatt steam turbine as an auxiliary to its present steam plant. The total estimated cost of installation is about $600,000.

ST. PAUL.—Plans will be ready Nov. 1, for a 15,000,000-gallon pumping engine. G. O. House is general superintendent of the water works.

ST. PAUL.—Joseph B. Merwin, of Omaha, and Peter J. Witt, of Paynesville, Minn., are planning to build a factory at St. Paul, to manufacture an automatic type semaphore.

SOUTHERN STATES

TAMPA, FLA.—It is reported that the Wilson & Toomer Fertilizer Co., of Jacksonville, Fla., will erect a $150,000 plant in Tampa.

JACKSON, MISS.—R. L. Benson, Chicago, owner of the Capital Light & Power Co., will spend $10,000 for machinery and other equipment.

BROWNWOOD, TEX.—The Texas Power & Light Co. will build a transmission line from Brownwood to Comanche.

DALLAS, TEX.—H. A. Frankenstein, 2615 Latimer street, is forming a company to manufacture reinforced concrete pipe. A plant will be built and in the equipment required is a 1½-ton rotary crane on a truck with a 30-foot boom, 100 sheet steel and cast iron pipe molds, a set of rolls to reroll reinforced steel and 500 feet each of 24 and 40-pound rails with fastenings.

MARSHALL, TEX. — The Texas & Pacific railroad will rebuild its shops recently damaged by fire and will make an investment of about $150,000.

SAN ANTONIO, TEX.—The Dixie Oil & Refining Co. will enlarge its plant at a cost of $40,000.

FORT SMITH, ARK.—Border City Iron & Steel Co. has been incorporated to operate the plant of the former Fort Smith Steel Co.; $25,000 capital stock; by James W. Arnold, R. W. Cotton and Kittie Collins.

AFTON, TENN.—L. D. Gastiher Co. will establish a hydro-electric power plant at a cost of $100,000.

DUCKTOWN, TENN.—The Tennessee Copper Co., with its general offices in New York, will issue $3,000,000 in bonds for the purpose of financing the increases in its plant capacity.

LAHOMA, OKLA. — The city of Lahoma plans to build a municipal electric light plant. Address the mayor.

SHAWNEE, OKLA.—The Dixie Culvert & Metal Co. is in the market for equipment for the manufacturing automobile license tags and other sheet metal specialties.

TERRAL, OKLA.—The Terral Bridge Co. has been incorporated; $50,000 capital stock; by S. G. Trout, J. W. Colburn, Lee D. Ewing and A. R. Barber, all of Terral, Okla.

TULSA, OKLA.—S. Gallais has had plans prepared by A. W. Black & Son, 522 Security building, St. Louis, for a 10-story, steel frame office building, 50 x 140 feet.

TYRONE, OKLA. — The Tyrone Electric Light & Power Co. has been incorporated; $10,000 capital stock; by H. Gilmore, G. W. Riffe and W. Y. Cowden.

VINITA, OKLA.—An election will be held Nov. 16 on issuing $50,000 in bonds for bridges.

WESTERN STATES

MANHATTAN, KAS. — Bonds for $69,500 have been voted for a water works system. Bids are being taken by F. Walter, city engineer.

MORRILL, KAS.—Bonds for $10,000 have been voted for a water works system.

TOPEKA, KAS.—A viaduct over Sixth street is being discussed. The city desires a reinforced concrete structure costing $100,000 and the railways involved want a steel structure encased in concrete to cost $60,000 to $75,000.

BILLINGS, MONT.—The Security Bridge Co. has been awarded the contract for the

erection of a steel bridge over Tongue river, 25 miles south of Sheridan.

GRAY BULL, WYO.—The roundhouse and machine shop of the C., B. & Q. railway at Gray Bull was damaged by a $30,000 fire.

PUEBLO, COLO.—Plans have been prepared for a 50 x 140-foot 2-story warehouse for Alva Adams to be erected at C and Lamkin streets. The estimated cost of construction is about $10,000.

SEATTLE, WASH.—The Metz Motor Co., Waltham, Mass.; has plans for a 5-story, concrete factory, 64 x 112 feet. J. P. Scearce is manager, Seattle.

SPOKANE, WASH. — Northwestern Buick Co. will establish a commercial garage and machine shop on First avenue.

SEATTLE, WASH.—The Pacific Boiler Co. has increased its capital stock to $100,000 and will make extensions.

SEATTLE, WASH. — The Cartmell-Kahle Pump Co. has been incorporated; $100,000; capital stock; by J. W. Kahle and C. A. Riddle.

SEATTLE, WASH.—The Alaska Engineering Commission, C. F. Dole, puchasing agent, Bell street dock, will construct a water works at Anchorage, Alaska, with pumps of 500 gallons per minute capacity.

BAKER, ORE.—The Baker Mines Co. is planning the installation of a pipe line to be 10,000 feet long together with two water wheels. This equipment will furnish power for the operation of milling machinery and air compressors.

PORTLAND, ORE.—The Oregon Motor Car Co. is preparing to build a plant 100 x 100 feet, costing $30,000. Hacobberger & Smith, Board of Trade building, are the architects.

PORTLAND, ORE.—Plans are being prepared by Edgar M. Lazarus for a $150,000 reinforced concrete hotel at Crown Point on the Columbia river. R. T. Dabney is interested.

PORTLAND, ORE. — The Oregon, California & Eastern railroad has been incorporated by Robert E. Strahorn, J. C. Ainsworth, William M. Ladd, Theodore B. Wilcox and others, of Portland. The company plans the following standard gage lines: A 150-mile line east and west to connect the Harriman and Hill lines at Bend, Ore., with the Oregon Short Line in Harney valley; a 170-mile line north and south to connect Bend with the Nevada, California & Oregon line at Lakeview, and a 60-mile line from Lakeview to Kirk. The surveys have been started and partially completed. It is estimated that $7,000,000 will be spent on the project.

SEASIDE, ORE.—An election will be held in December on issuing $50,000 in bonds for a water works system.

ESCONDIDO, CAL. — The board of city trustees is having plans prepared for a municipal electric light and power plant and a gas manufacturing plant.

OAKLAND, CAL. — The Marchant Calculating Machine Co. will complete the first unit of its plant within 60 days. The equipment needed includes milling machines, lathes and drill presses.

SANTA CRUZ, CAL.—A special election will be held soon to vote on $100,000 in bonds for a water works system.

NEW CATALOGS

STEAM SHOVELS.—The line of steam shovels manufactured by the American Steel Dredge Co., Fort Wayne, Ind., is described and illustrated in a bulletin recently issued. These shovels are of the single-line type and this type of construction is discussed in detail. Photographs and specifications are included.

METAL CUT SAWS.—An interesting 24-page catalog, issued by the Simonds Mfg. Co., Fitchburg, Mass., contains, in addition to descriptions of the company's metal saws, files and accessories, a comprehensive treatise on various methods of cutting steel, and on cold sawing machines, metal saws, saw teeth and kindred subjects.

STEEL FLOORS.—The Trussed Concrete Steel Co., Youngstown, O., has issued a 16-page booklet devoted to its fireproof floors and bearing partitions of pressed steel construction. The booklet is well illustrated with service and construction views. It contains a complete list of specifications for steel floors, steel hollow partitions, solid partitions, roofs and ceilings.

DISC VALVES.—The Chicago Pneumatic Tool Co., Chicago, has recently issued a 12-page booklet describing the flat plate disc valves used in its pneumatic compressors. These valves are said to be highly efficient in operation, as the opening varies according to the speed at which the compressor is run, the plates and springs being independent of one another. They are also said to be silent in operation. Numerous illustrations are given.

HAND TRUCKS.—In a 44-page catalog, the Cowan Truck Co., Holyoke, Mass., describes its all-metal trucks for use in machine shops, factories, foundries and other industrial plants. The catalog is illustrated with numerous views of the company's trucks in operation. Eight models are described, ranging from 4,000 to 2,000 tons capacity. These trucks are said to be practically indestructible and to be especially adapted to the moving of material under difficult conditions.

VACUUM PUMPS.—The Scranton Pump Co., Scranton, Pa., has issued a bulletin describing its jet condensers and vacuum pumps. The condenser consists of a mixing chamber of proper design and one pump which handles the atmospheric air, condensed steam and condensing water. These condensers are built in a self-contained unit, the condenser being located directly above the air pump so that the condensing water can be handled quickly and efficiently. This booklet is well illustrated.

MANGANESE STEEL:—The Taylor-Wharton Iron & Steel Co., High Bridge, N. J., has issued an 8-page bulletin, describing manganese steel parts for coke-handling machinery. This bulletin illustrates and outlines in detail the application of the Taylor company's steel to chains for standard coke conveyors and drivers; the usefulness of manganese steel for shovels for coke machines, screen plates, hammers for crushers and pulverizers, chutes, gears, guide rollers, boom racks, wearing strips, elevator buckets, etc., also is pointed out.

MACHINE PARTS.—An 18-page bulletin and a 10-page bulletin issued by the Taylor-Wharton Iron & Steel Co., High Bridge, N. J., describe manganese steel machine parts for coal mine and coke handling equipment. These parts are made exclusively from manganese steel. Among the accessories described are segments for rolls, chutes, mine car wheels, gear and sprocket wheels, detachable link belting and chain, crusher and pulverizer parts, screen plates, coke machine shovels and hammers. The bulletins contain numerous illustrations.

POWER HAMMERS.—Six, 8 and 12-page folders, published by the Mayer Bros. Co., Mankato, Minn., describe the company's light trip hammer and patent electric bit die for the manufacture of chisel point machine bits, and also a combination die for making and sharpening chisel and pick points. Among the features of the power hammer are the one-piece frame casting, the foot treadle which permits the operator's heel to rest on the floor, the adjustable tension spring and treadle release spring, the steel ram and the adjustable brass box and brass pitman. The folders contain numerous illustrations.

PNEUMATIC TOOLS AND EQUIPMENT.—The Ingersoll-Rand Co., 11 Broadway, New York, has issued a series of bulletins describing its extensive line of pneumatic tools and equipment. The bulletins are devoted respectively to riveting, chipping, caulking, scaling and flue-beading hammers, which are adaptable to a variety of industrial purposes. One bulletin describes air compressors with short belt drive and another is devoted to the Ingersoll-Rogler compressor and details of its construction are included. The hoist manufactured by the Ingersoll-Rand Co. also is illustrated.

TWIST DRILLS. — Twist drills, reamers, gear and mill cutters and machine tools manufactured by the Union Twist Drill Co., Athol, Mass., are described in a 382-page catalog recently published, which contains, in addition to the tools listed, much interesting data. Formulas for determining the dimension of gears by diametral pitch, compartive sizes of gear teeth, decimal equivalents of the numbers of twist drill and steel wire, various standard wire gages, thickness and weight of sheet steel and iron, weights of square and round bars of carbon steel, calculations of pulley diameters and of the horsepower of leather belting are given. Among the machine tools described are cold saw cutting-off machines, hob grinders, circular grinding machines, formed cutter grinders, radial grinding gages, sharpening cutters, universal cutter and reamer grinders and several testing fixtures.

PNEUMATIC TOOLS.—A 28-page bulletin, published by the Chicago Pneumatic Tool Co., Chicago, describes self-rotating hammer drills which are adapted to a wide range of purposes, including mining, tunneling, quarrying, road building, trench work, etc. The bulletin is illustrated with views of the company's drills in actual use, and also with sectional diagrams. Among the features of these drills are the hammer valve, which governs the reciprocation of the hammer piston, the independent hammer action and the exhaust throttle for clearing away cuttings from the drill hole. The compressed air which operates the drill, instead of being led to the atmosphere, is discharged into the valve chamber of the hammer cylinder and operates the hammer piston by means of a ball valve action. The rotation mechanism is continuous in one direction and has no ratchet or pawl parts.

The University of Tennessee, at Knoxville, in co-operation with the Tennessee Manufacturers' Association, has started engineering schools in the different industrial centers of the state, for the purpose of affording instruction to mechanics and artisans employed in manufacturing plants, enabling them to make more rapid progress and to render better service. The schools are already being largely attended. Mechanical, steam and electrical engineering and other technical subjects will be taught.

The Potts Bros. Iron Works, at Pottstown, Pa., which has been idle for a number of years, is to be offered for sale.

IRON AND STEEL PRICES

Corrected up to Tuesday noon

PIG IRON

(Delivery to Dec. 31.)

Bessemer, valley	$16.00
Bessemer, Pittsburgh	16.95
Basic, Pittsburgh	15.95
Basic, eastern Pa.	17.25 to 17.50
Malleable, Pittsburgh	15.95
Malleable, first half, Pbgh.	15.95
Malleable foundry, Chicago	15.50
Malleable foundry, Philadelphia	16.75 to 17.25
Malleable foundry, Buffalo	15.50 to 16.00
No. 1X foundry, Philadelphia	16.75 to 17.00
No. 2 foundry, Pittsburgh	15.95
No. 2 Fdy., first half, Pbgh.	15.95
No. 2 foundry, first half, valley	15.00
No. 2 foundry, Cleveland	15.50 to 15.80
No. 2 foundry, Ironton	15.50 to 16.00
No. 2 foundry, Chicago	15.50
No. 2X foundry, Philadelphia	16.25 to 16.75
No. 2X fdy., N. J. tidewater	16.25 to 16.75
No. 2X foundry, Buffalo	15.50 to 16.00
No. 2 plain, Philadelphia	15.50 to 15.75
No. 2 plain, N. J. tidewater	15.75 to 16.25
No. 2 plain, Buffalo	15.25 to 15.50
No. 2 southern, Birmingham	12.50 to 13.00
No. 1 southern, Cincinnati	15.40 to 15.90
No. 2 southern, Chicago	15.50 to 16.00
No. 2 southern, Phila. delivery	15.50 to 16.00
No. 2 southern, Cleveland	16.50 to 17.00
No. 2 south'n, New York docks	15.50 to 16.00
No. 2 southern Boston, docks	15.75 to 16.25
No. 2 south. interior, New Eng.	16.50 to 17.50
No. 2 southern, St. Louis	15.90
Virginia No. 2X furnace	14.00 to 14.50
Virginia 2X, Philadelphia	16.50 to 16.75
Virginia 2X, Jersey City	16.85 to 17.10
Virginia 2X, Boston points	17.00 to 17.25
Gray forge, eastern Pa.	15.50 to 15.75
Gray forge, Pittsburgh	15.45
Gray forge, first half, Pbgh.	15.20
Gray forge, Birmingham	10.50
Silveries, 8 per cent, Jackson, O.	19.00 to 19.50
Silveries, 5 per cent Birmingham	13.00
Silveries, 8 per cent, Chicago	20.00 to 20.50
Standard low phos., Phila.	27.00 to 28.00
Lebanon low phos., furnace	23.00 to 24.00
Low phos., Pittsburgh	25.50 to 26.00
Charcoal, Lake Superior, Chgo., Nos. 1 to 4	16.25 to 16.75
Charcoal, Buffalo	16.75 to 18.25
Charcoal, Birmingham	21.50

IRON ORE

Lake Superior Ores.

(Lower lake ports.)

Old range Bessemer, 55 per cent	$3.75
Mesabi Bessemer, 55 per cent	3.45
Old range, non-Bess., 51½ per cent	3.00
Mesabi non-Bessemer, 51½ per cent	2.80

Foreign Ores.

(Per unit Philadelphia.)

(Prices nominal.)

Foreign Bess., 50 to 65 per cent	8 to 8½
For'n non-Bes., 50 to 65 per cent	8 to 8½

COKE

(At the ovens.)

Connellsville furnace	$2.50 to 2.65
Connellsville fur., Nov. and Dec.	2.25
Connellsville foundry	2.60 to 2.75
Connellsville fdy. contr.	2.65 to 2.90
Wise county furnace	2.50 to 2.75
Wise county foundry	2.65 to 3.00
Pocahontas furnace	2.50 to 2.75
Pocahontas foundry	2.75 to 3.25
New River, foundry	3.00 to 3.50
New River, furnace	2.50 to 2.75

FERRO ALLOYS AND STEEL MAKING METALS

Ferro mang., delivered (prompt)	100 to 110
Ferro mang., Balti. (future)	100.00
Spiegeleisen 20 per cent, furnace	28.00
Ferro-silicon, 50 per cent, Pbgh.	86.00 to 88.00
Ferro-silicon, 50 per cent, Phila.	85.00 to 87.00

Bessemer ferro-silicon, 9 per cent to 10 per cent, $22.00; 10 to 11 per cent, $23.00; 11 to 12 per cent, $24.00; 12 to 13 per cent, $25.00 a ton at the furnace at Ashland, Jackson and New Straitsville, O.

Ferro-chrome, 4 to 6 per cent carbon, 25 cents per pound; 2 per cent carbon, 45 cents per pound, delivered.

Ferro-vanadium, $3.15 per pound of contained alloy, Pittsburgh.

Ferro-carbon titanium, 8 to 12½ cents per pound in carloads.

Nickel, 50 to 55 cents per pound.

Freight Rates via Panama Canal

Rates on finished materials, including plates, shapes, bars, wire, nails, etc., to Pacific coast points via Panama canal, per 100 lbs., in carload lots, exclusive of insurance and dockage.

From New York	$0.40
From Pittsburgh	.619
From Youngstown	.619
From Niles	.619
From Wheeling	.619
From Steubenville	.619
From Johnstown	.604
From Coatesville	.545
From Steelton	.555
From Bethlehem	.529
From Cleveland	.65
From Chicago	.765

Ferro-tungsten, nominal.

Cobalt metal, $1.60 to $1.75 per pound, Pittsburgh.

Aluminum, 55 to 56 cents per pound, New York.

Ferro-molybdenum, Pittsburgh, nominal.

SEMI-FINISHED STEEL

Open hearth billets, Phila.	$32.00 to 34.00
Bessemer billets, Phila.	28.00
Forging billets, Phila.	36.00 to 40.00
Forging billets, Pbgh.	35.00 to 40.00
Forging billets, Chgo.	32.00 to 34.00
Wire rods, Pittsburgh	32.00 to 33.00
Bess. bill., Youngstown	26.00
Open hearth billets, Youngstown	28.00
Bessemer billets, Pittsburgh	27.00
Open hearth billets, Pittsburgh	28.00
Bess. sheet bars, Youngstown	27.00
Op. h'th sheet bars, Youngstown	28.00
Bess. sheet bars, Pittsburgh	27.00
Op. h'th sh. bars, Pbgh.	28.00
Muck bar, Pittsburgh	28.00

RAILS AND TRACK MATERIAL

Stand. Bess., rails, Pbgh. & Chg.	1.25c
Stand. op-h'th rails, Pbg. & Chg.	1.34c
Light rails 8 to 10 lbs. Pbgh.	1.49c
Light rails 8 lb. Chgo.	1.31c
Light rails 12 to 14 lbs. Pbgh.	1.44c
Light rails 12 lbs. Chgo.	1.26c
Light rails 16 to 20 lbs., Pbgh.	1.39c
Light rails 16 to 20 lbs., Chgo.	1.21c
Light rails 25 to 45 lbs., Pbgh.	1.34c
Light rails 25 to 45 lbs. Chgo.	1.16c
Relaying rails, standard, Pbg. & Chgo.	$23.00 to 24.00
Relaying rails, light, Chgo.	21.50 to 22.50
Angle bars, st. sect. Pbgh. base.	1.50c to 1.75c
Angle bars, st. sections, Chicago	1.50c to 1.75c
Spikes, railroad, Pbgh.	1.70c
Spikes, railroad, Chgo.	1.65c to 1.75c
Track bolts, Pbgh.	2.10c to 2.25c
Track bolts, Chgo.	2.10c to 2.25c
Tie plates, Chgo.	30.00 to 32.00

Freight Rates, Pig Iron

Mahoning and Shenango valleys to:—	
Cleveland	$0.95
Newark, N. J.	2.98
Boston	3.18
Philadelphia	2.78
Pittsburgh	.95
St. Louis	3.18
Buffalo to:—	
Albany, N. Y.	$1.26
New England (all rail)	2.58
New York and Brooklyn (all rail)	2.58
New York and Brooklyn (by canal)	1.25 to 1.60
Virginia furnaces to:—	
Boston docks (r. and w.)	$3.05
New England (all rail)	3.25
New York dock (r. and w.)	2.88
Birmingham, Ala., to:—	
Cincinnati	$2.90
Chicago	4.00
Cleveland	4.00
Louisville, Ky.	2.65
New York (all rail)	6.15
New York (rail and water)	4.25
Philadelphia (all rail)	5.20
Philadelphia (rail and water)	4.00
Pittsburgh	4.90
Savannah, Ga.	2.75
Chicago, to:—	
Des Moines	$2.80
Milwaukee	.50
Moline, Ill.	1.40
Omaha	3.58
St. Louis	1.58
Ironton and Jackson, O., to:—	
Chicago	$2.54
Cincinnati	1.26
Cleveland	1.62
Detroit	1.81
Indianapolis	1.58

SHAPES, PLATES AND BARS

Structural shapes, Pittsburgh	1.45c to 1.50c
Structural shapes, Chgo.	1.59c to 1.64c
Structural shapes, Philadelphia	1.609c to 1.659c
Structural shapes, New York	1.619c to 1.669c
Struc. shapes, San Francisco	2.00c to 2.05c
Tank plates, Chgo.	1.59c to 1.64c
Tank plates, Pittsburgh	1.45c to 1.50c
Tank plates, Philadelphia	1.609c to 1.759c
Tank plates, New York	1.619c to 1.669c
Bars, soft steel, Pittsburgh	1.45c to 1.50c
Bars, soft steel, Chicago	1.59c to 1.64c
Bars, soft steel, Philadelphia	1.609c to 1.659c
Bars, soft steel, New York	1.619c to 1.669c
Hoops, carloads, Pittsburgh	1.60c
Bands, Pittsburgh	1.40c
Shafting, Pbg., contr. car loads	58 off
Bar iron, Chgo.	1.45c
Bar iron, Philadelphia	1.559c to 1.609c
Bar iron, New York	1.569c to 1.619c
Bar iron, Cleveland	1.40c to 1.50c
Bar iron, Pittsburgh	1.50c
Hard steel bars, Chicago	1.30c to 1.35c
Smooth fin., mchy. steel, Chi.	1.68c

SHEETS AND TIN PLATE

No. 28, black, Pittsburgh	2.10c
No. 28, black, Chgo.	2.29c
No. 28, tin mill, black, Pbgh.	2.05c
No. 28, galvanized, Pbgh. nom.	3.50c to 3.60c
No. 28, galvanized, Chgo.	3.79c
No. 10, blue annld., Pbgh.	1.60c to 1.70c
No. 10, blue, annealed, Phila.	1.809c to 1.909c
Tin plate, 100 lb., coke base	3.10c to 3.20c

EXTRAS FOR SHEET OR TIN MILL SPECIFICATIONS

(Per hundred pounds.)

Single pickled, cold roll, and re-anl.	30 cents
Hot roll'd pick'd and anl., tin mill	25 cents
Full pickl'd, cold rolled and re-anl.	50 cents
Auto sheets	75 cents
Blued stove pipe stock	10 cents
Range steel	30 cents
Re-squaring	10 cents
Roller leveling	10 cents
Patent leveling and re-squaring	35 cents
Oiling sheets	10 cents
Deoxiding	10 cents
Lime finish	10 cents
Open-hearth stamping steel, free fr. mill scale	55 cents
Special open hearth deep stpg. steel free from mill scale	80 cents
Extra deep special auto body stock	$1.25
Ext. for 28 gage ov. 32 to 36-in. wide	10 cents

No reduction for sheets not annealed.

The above extras apply on both sheet and tin mill specifications, at the same rate.

IRON AND STEEL PIPE

(Pittsburgh.)

	Black.	Galv.
	Butt-weld.	
Steel, ⅜ to 3 inches	79	63½
Iron, ⅜ to 2½ inches	71	52
	Lap-weld.	
Steel, 2½ to 6 inches	78	62½

BOILER TUBES

Steel, 3½ to 4½ inches l. c. l.	71
Iron, 3½ to 4½ inches l. c. l.	59

WIRE PRODUCTS

(Retailers' price 5 cents above jobbers' quotation.)

Wire nail jobbers, Pittsburgh	$1.85
Plain wire, jobbers, Pittsburgh	1.70
Galvanized wire, jobbers, Pbgh.	2.40
Polished staples, Pbgh.	2.00
Galvanized staples, Pbgh.	2.70
Barb wire, painted, jobbers, Pbgh.	2.00
Barb wire, galv., jobbers, Pbgh.	2.70